NOVEMBER 1959

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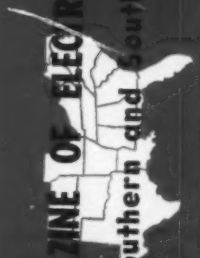
Electrical South

SOUTHERN MAGAZINE OF ELECTRICAL CONSTRUCTION
Serving the 18 Southern and Southwestern States



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How to install headerduct — see page 44

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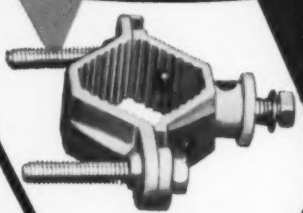

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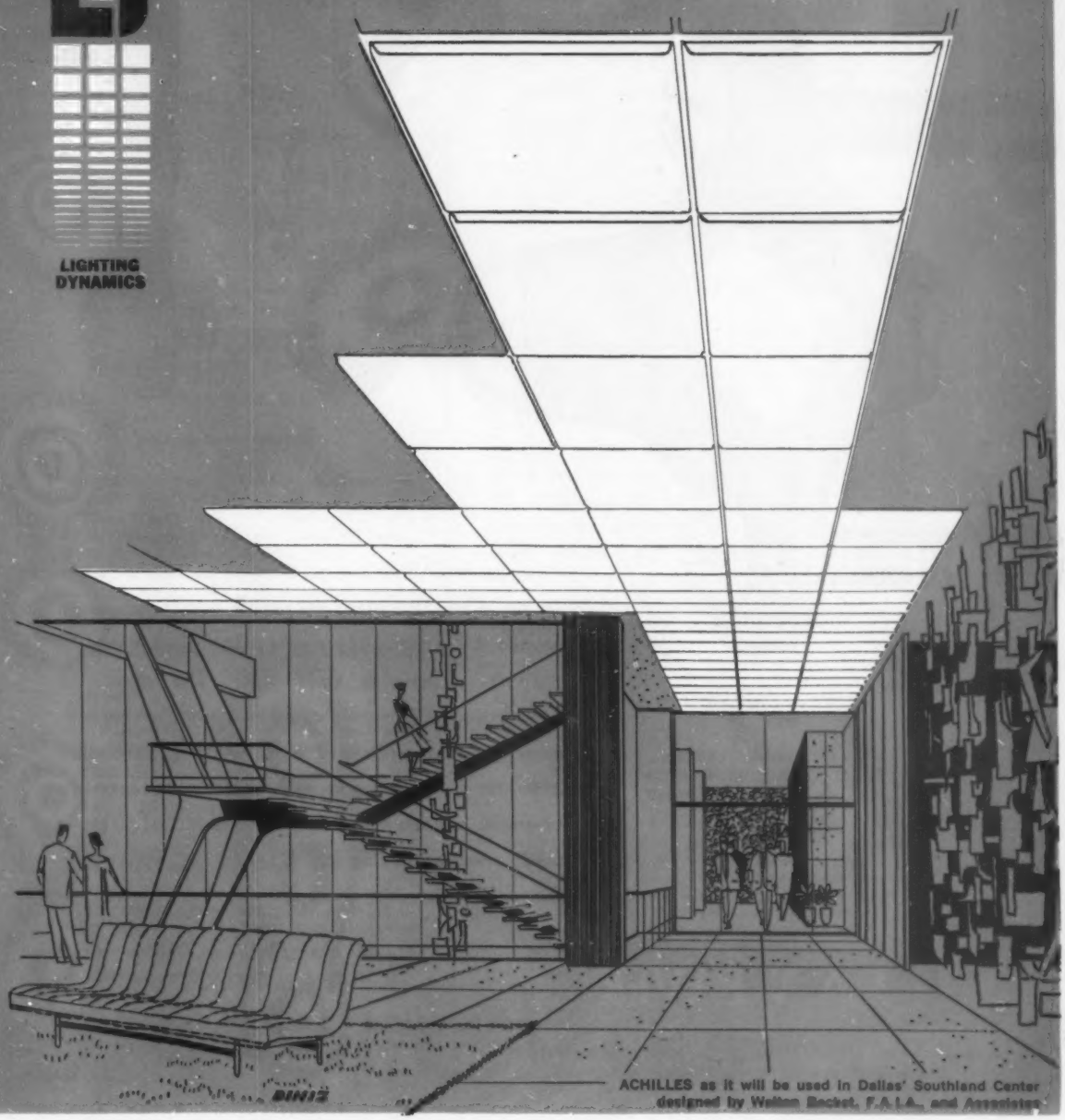

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Dallas:
Baron Creager, Bob King, 6131 Luther Lane, Suite 208, Dallas 25, Texas. Tel. Fleetwood 7-2937.

Editorial and Business Offices
Tel. Trinity 4-4462
806 Peachtree Street, N. E.
Atlanta 8, Georgia

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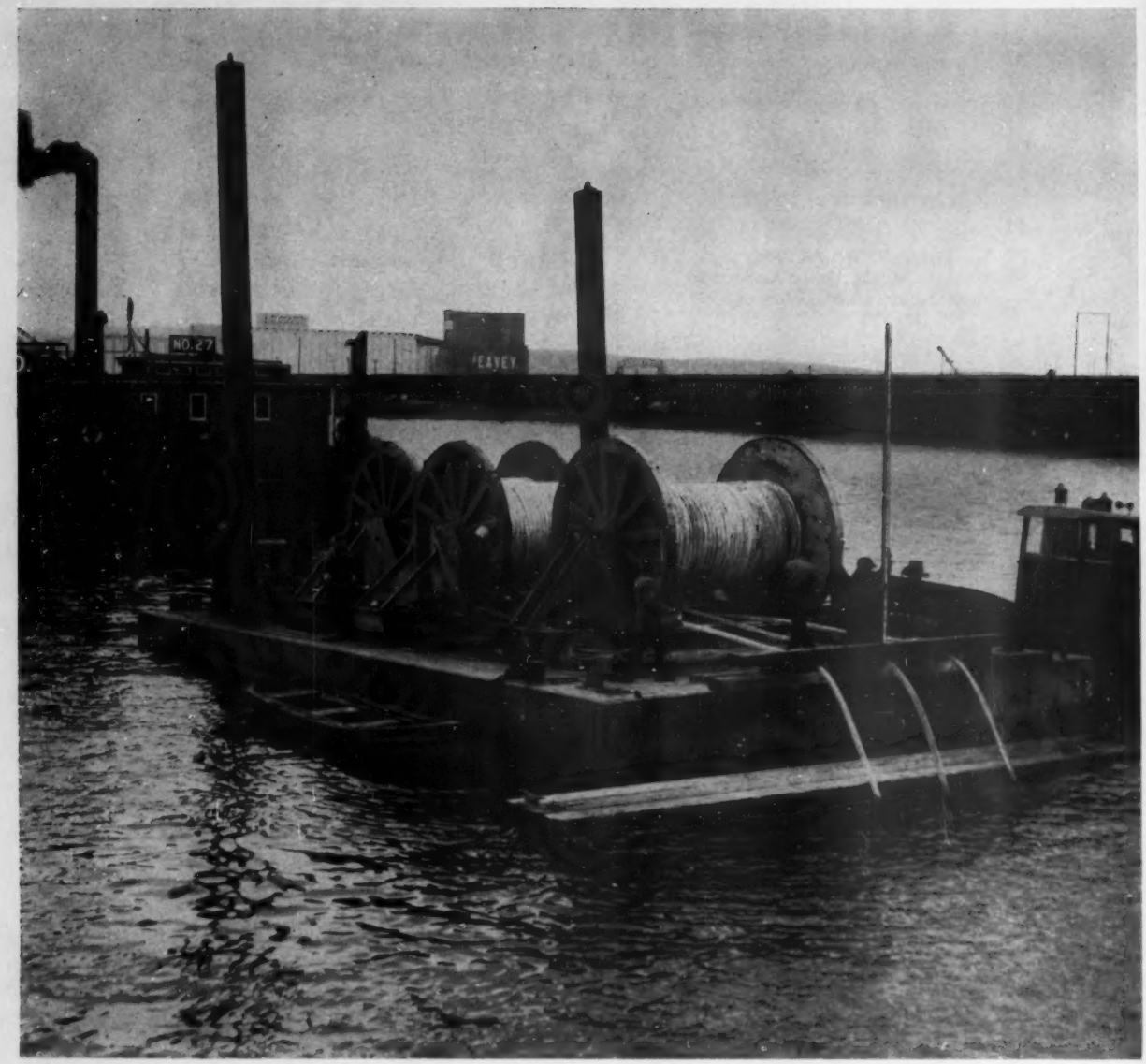

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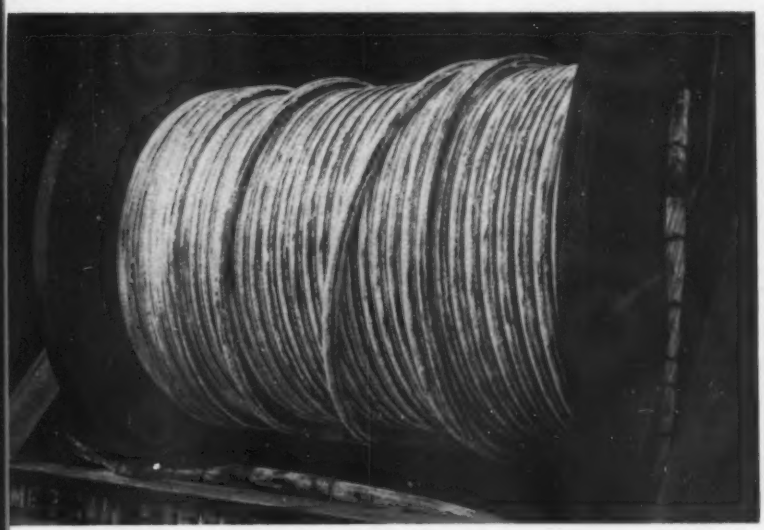

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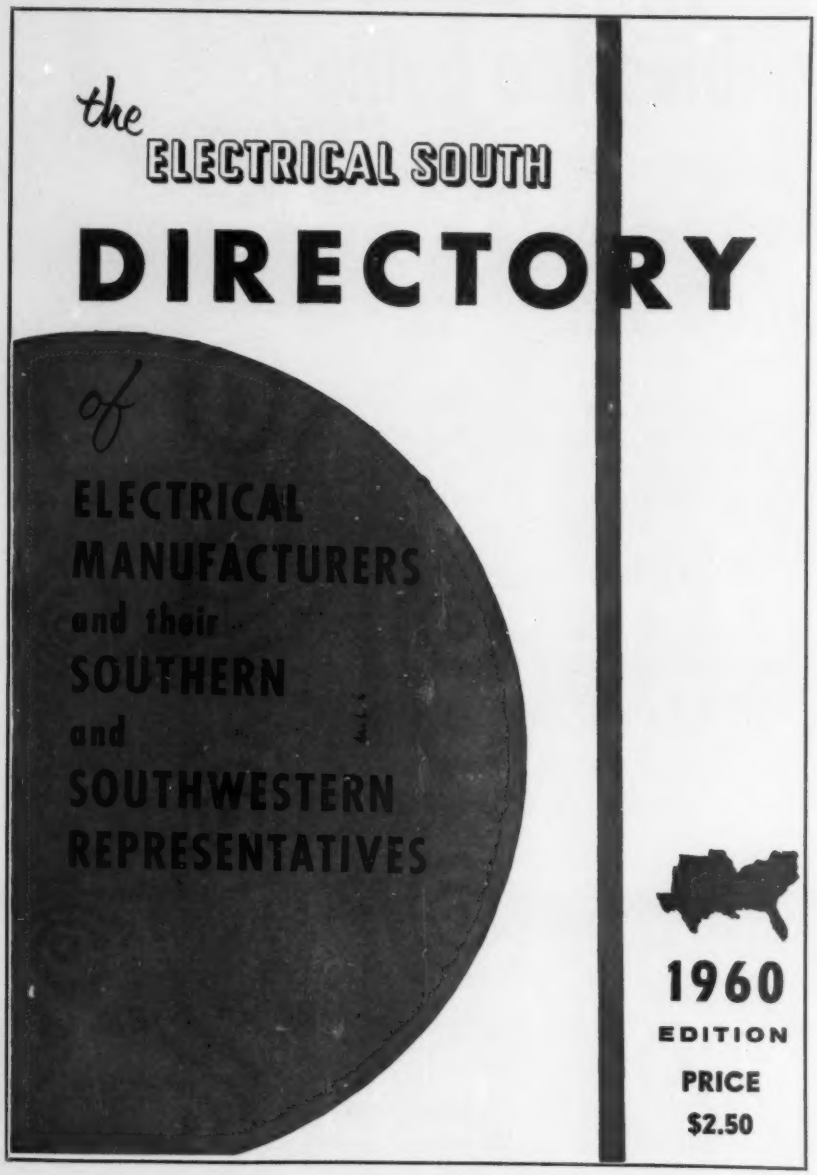

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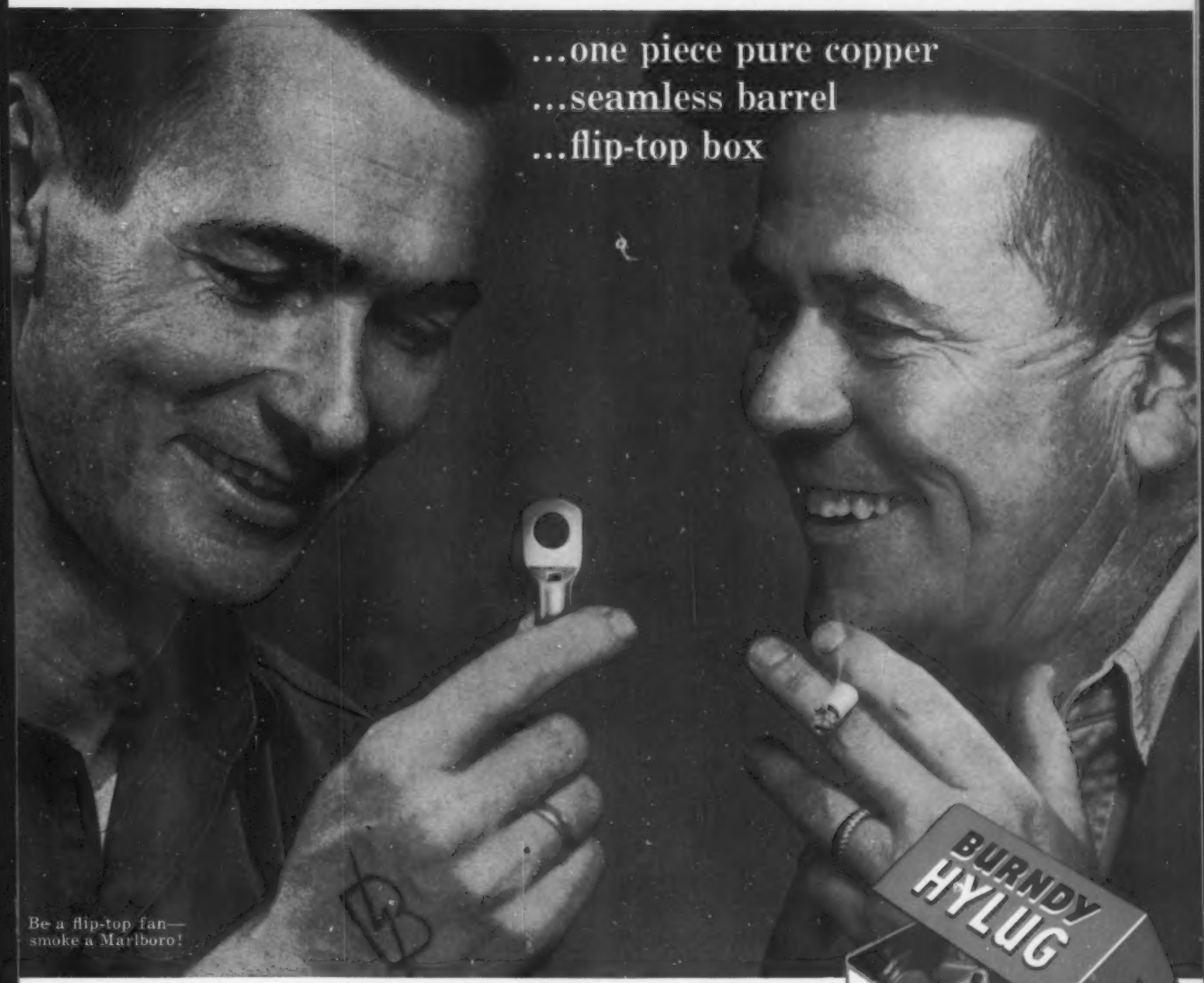

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59-14

Economic comment

by J. Whitney Bunting, Ph.D.

Contributing Economics Editor

Work stoppages and foreign competition

One of the more serious results of strikes and labor unrest, such as has been seen recently in the steel industry, is the potential loss of American markets for American industry. World wide there is every indication of wholesome and healthy industrial progress that will increase competitive pressures upon this nation's manufacturers. This pressure is presently felt primarily in overseas markets where our industries are often at a price disadvantage because of higher operating costs, principally in the area of wages and salaries.

A view of the economic buying habits of neighbor nations in South America will prove this point. Here, where there is every reason to assume a strong two-way interchange of goods and services, there is practical evidence that America can and does lose market position due to new and forceful industrial progress from other nations. Strikes such as in steel further aggravate this situation.

However, the seriousness of the problem is not related to foreign markets alone. During the period of the steel shut-down, United States users of steel and steel products have turned for help to overseas producers of this much needed metal. Small as this supply must be because of other normal demands upon these producers, there is ample reason to believe that there will be some increased foreign competition when the industry returns to normal.

Advanced wage patterns often increase the danger of foreign competition because of lower wage patterns for similar work abroad.

In a competitive economic society such as that of the United States there can be no relaxation of the goal to produce more items of the best quality at lower prices. Only by following this pattern can domestic industry continue to control the markets within this territory as well as gain a fair share of the markets in other lands.

It is reasonable to believe that if this nation is to continue to progress and grow in economic strength, it can only be accomplished through a strong and vigorous pattern of industrial productivity. Other nations recognize this fact and give far more than lip service to the development of strong industrial enterprises.

Sometimes, in America, there is a tendency to believe that this economy of ours is so strong that foreign competition cannot be harmful. Nothing is further from the truth. The American economy is strewn with the shadows of many, once great, industries that could not stand local or foreign competition and thus dwindled to comparative insignificance or out of the picture entirely.

Costs of production must be kept competitive if America is to maintain its excellent economic record both here and abroad. This item must be factored into any labor settlement if it is not to be harmful in the long run. The key, of course, is in the element of industrial productivity.

Productivity and competitive strength

The ability of American industry to pay high returns to capital, labor, and management, and still compete with foreign producers is in the factor of productivity. As long as each productive agent increases its productivity of quality merchandise, it is possible to increase the financial return to that agent and still maintain a given price level.

Thus, if labor itself creates more goods of quality, then it can rightfully demand a greater share of the value of the goods produced on the market.

If capital owners or company managers create the added productivity, then they merit their added shares of the value produced.

The danger, of course, is in measurement and apportionment. Just how much productivity is added by more efficient management? How much comes from the acquisition of new and possibly automated machinery? What increase in productivity can be directly traced to the energy and vigor of the labor force?

It can be readily seen that in most instances these questions are almost impossible to answer with any degree of accuracy.

Yet unless there is a certain increase in the quantity and quality of goods produced there is no justification for added return to any party. Failure to recognize and observe this salient fact can cause the loss of valuable industrial markets both home and abroad.

Allied problem

One further facet of this problem, particularly as it relates to the steel stoppage, is that of retail merchandise available for the Christmas trade. Although most producers of consumer durables have not felt, as yet at least, a serious reduction of steel for their productive use, supplies are now quite short. It is entirely possible that in many lives there will be a real shortage of appliances and similar products for sale this year.

Those merchants who have storage facilities and thus the ability to stockpile appliances and small items of consumer equipment should be in a truly commanding market position. Those dealers without such storage facilities will find themselves sold out rather quickly, with little opportunity for restocking their shelves. The impact of this situation on the size of the Christmas market can not be estimated at this time.

Christmas shoppers with appliances in mind, particularly those that use steel as a major component part, should be advised to buy early to avoid almost certain disappointments as the holiday period nears. Retailers who want to have available these items in demand for their customers must insure a supply from distributors if they hope to serve their customers adequately.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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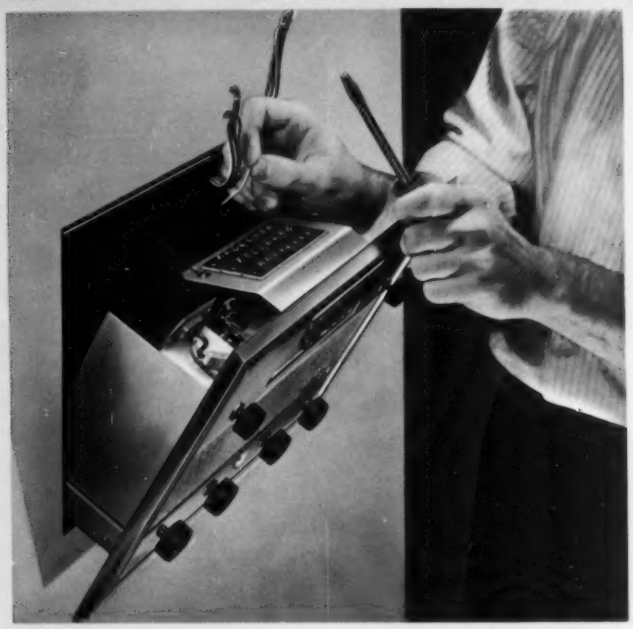

The NuTone Intercom leaves both hands free during installation. Ground strap assures permanent grounding. All boxes are easily adjustable to wall line. Front panels are big enough to cover roughly cut holes. Terminal board is on top of master. Wiring is marked for easy identification.

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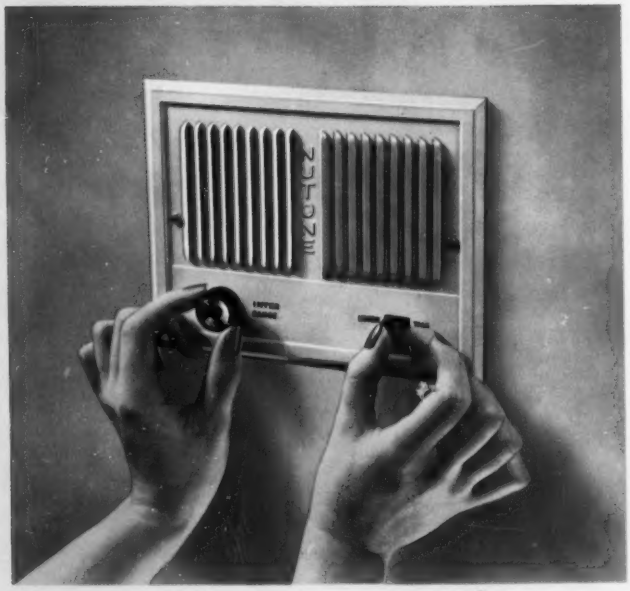

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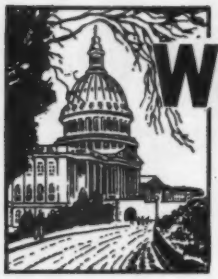

Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Legal contract does not make closed shop legal

EVEN THOUGH there was nothing illegal in the contract, in actual practice an illegal closed shop existed at Moore Electric Co., a trial examiner for the National Labor Relations Board holds. The firm hired electricians from IBEW Local 466 at Charleston, W. Va.

Examiner Owsley Vose noted that the record shows that Moore's foremen did substantial hiring, that Moore obtained all its men from the business manager of Local 466, and that when no Local 466 men were available, the union sent men from neighboring IBEW locals.

Furthermore, the Local's by-laws: gave the executive board power to terminate any member; required all foremen to be union members; and allowed no appeal by the foreman from the union steward's rejection of a job applicant.

"The net result of these internal union arrangements," wrote Vose, "is to place pressure upon foremen to hire members of Local 466 and to render them subservient to the will of Local 466 and its business manager who is actively interested in furthering and controlling through his office, the employment of members of Local 466."

As a remedy, Vose recommends that the Labor Board order the Local to reimburse Moore electricians dues paid during an 11-month period.

In many cases coming before the Board the employers as well as the union are involved in back dues reimbursements. This did not happen to be one of these cases. But as you can see, if in practice you operate a closed shop—hiring only union members through the union—the Labor Board will find that you have a closed shop. It will not matter that the language in your contract is perfectly legal.

* * *

Labor Board upheld on subcontractor ruling

THE U. S. Supreme Court refused to review a National Labor Relations Board ruling that it is legal for a contractor to sign an agreement with a union that he will use only union subcontractors.

The effect of the Court's refusal is to make such agreements between contractors and unions legal.

The Labor Board ruled, however, that unions cannot strike to enforce this type of agreement.

The Labor Board reasoned that federal law prohibits discrimination against employees but does not deal with discrimination by one employer against another. In other words, it is legal for a union employer to discriminate against a non-union employer. This is the case that the Supreme Court refused to review.

* * *

Arbitration to decide contracting-out disputes

CONTRACTING-OUT disputes between AFL-CIO unions will go to arbitration if a special constitutional convention approves, as is expected, a plan to end jurisdictional warfare between AFL-CIO unions.

The convention would convene sometime next year.

Under the plan, jurisdictional disputes—which include contracting-out fights—would be submitted to binding arbitration.

As readers of this column know, contracting-out fights involve building trades unions, like the IBEW, and industrial unions. The disputes occur when building trades union members are called to work at plants which have contracts with industrial unions. Often the industrial unions force the building trade union members off their jobs, thus making it impossible for contractors to fulfill their obligations.

Under the AFL-CIO's proposed plan, prompt arbitration, rather than force, would decide the dispute.

* * *

Closed shop declared in another W. Va. case

ANOTHER issue in the same case involved the Charleston, W. Va., division of the National Electrical Contractors Association. Contracts between chapter members and Local 466, which non-members of the chapter also signed, contained the clause that all temporary power and lighting on construction jobs "shall be installed and maintained, moved and removed by IBEW journeymen wiremen."

The provision is illegal, Trial Examiner Vose declared, because it imposes a closed-shop on all temporary power work. Vose found the provision acceptable with the removal of "IBEW."

Vose again recommended that the Local reimburse dues collected. In many similar cases, however, employers innocently entangled by such clauses have had to reimburse the dues.

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Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

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All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

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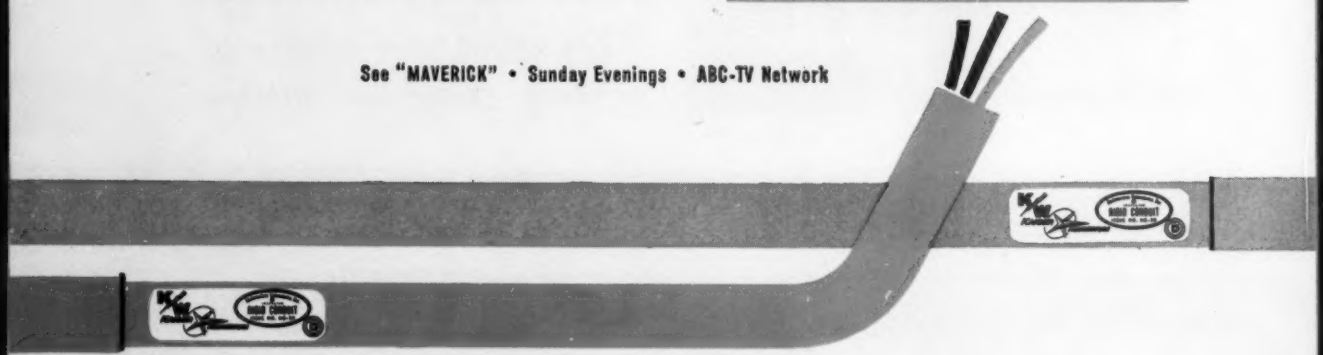

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BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

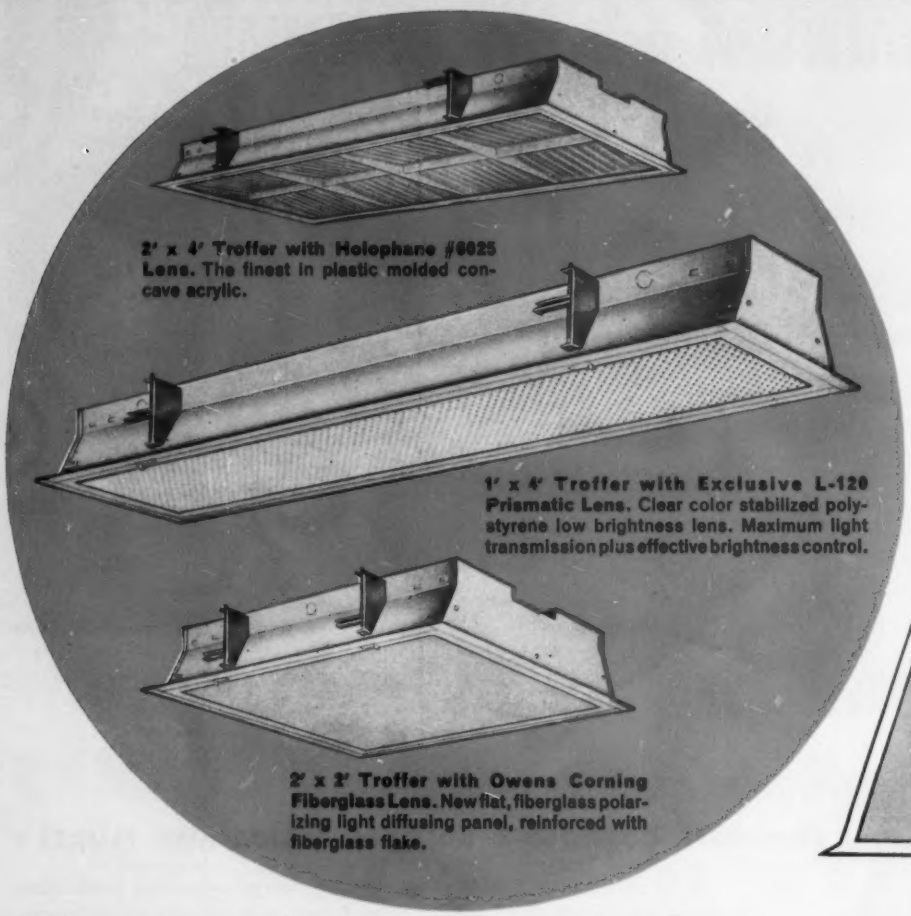
AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

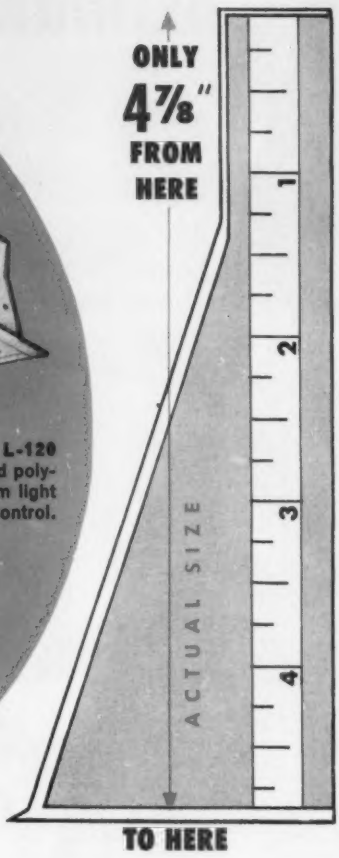
JASPER BLACKBURN CORPORATION

1525 WOODSON RD. • ST. LOUIS 14, MO. • WYdown 3-9430

NOW FROM BENJAMIN

NEW SHALLOW LINE TROFFERS


2' x 4' Troffer with Holophane #6025 Lens. The finest in plastic molded concave acrylic.
1' x 4' Troffer with Exclusive L-120 Prismatic Lens. Clear color stabilized polystyrene low brightness lens. Maximum light transmission plus effective brightness control.
2' x 2' Troffer with Owens Corning Fiberglass Lens. New flat, fiberglass polarizing light diffusing panel, reinforced with fiberglass flake.



The newest and finest engineered troffers available today. Laboratory tested and engineered to achieve the latest in modern troffer lighting. *Only 4⅞" deep*, these units allow reduced plenum depths and permit greater structural freedom between floors.

New Benjamin shallow-line troffers are the fastest installing troffers on the market. One piece housing in both 4' and 8' units gives maximum structural strength. Fused for control equipment protection. The most complete selection of closures in the lighting industry.

For fixture engineering at its finest, look to Benjamin. Your local Benjamin representative will be happy to help you. Contact him on any problem...large or small.

- ✓ **Swivel-bar suspension eliminates overhead yokes, reduces installation cost**
- ✓ **Simplified hinge mechanism ...no screws to tighten**
- ✓ **Positive action tab-lock latch**
- ✓ **Housing fabricated and wired in one piece unit**

BENJAMIN

ELECTRIC MFG. CO., Des Plaines, Illinois

Subsidiary of THOMAS INDUSTRIES INC.

BENJAMIN · MOE LIGHT · STAR LIGHT · ENCHANTE · SAN MARINO

INFORMATION CENTER

BOOKLETS • NEW PRODUCTS • ADVERTISEMENTS

Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

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Electrical South

806 PEACHTREE ST., N. E.

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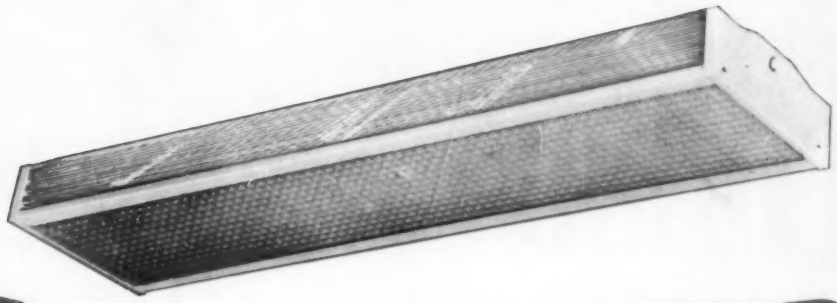


LIGHTING AN OFFICE ?

. . . we suggest the

"L & P" EXPLORER

U. L. Approved

APPLICATION:

Specifically designed for lighting offices, meeting rooms, and any installation where design and efficiency are important.

TYPE:

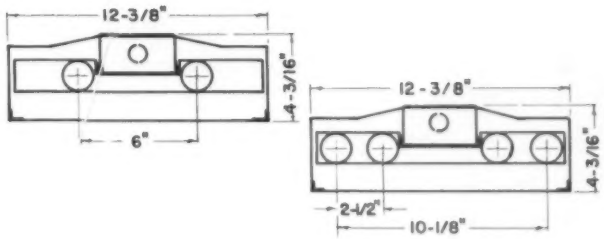
Fluorescent, rapid start or slimline two or four lamp. Plastic sides.

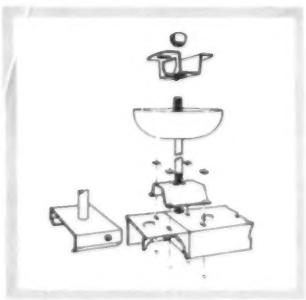
CONSTRUCTION:

Plastic sides which snap quickly in or out of fixture for easy maintenance. Reflector snaps locked when pressed up to channel. L & P quality finish on 20 gauge steel, welded construction. Ample knockouts. Available with plastic louver, prismatic or ribbed plastic bottom diffuser.

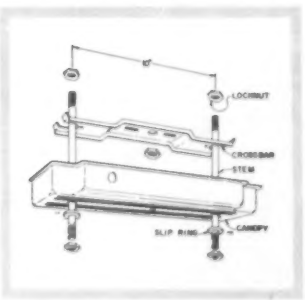
MOUNTING:

Fixture may be surface or pendant mounted. Designed for continuous row or single unit installation.





ST 124, single stem canopy set, used when joining fixtures on continuous runs. Normally two ST 124 sets are used for each individually mounted 8 ft. unit. Std. stem length 24".



ST 10, double stem canopy set. Used for suspending individual units normally not over 4 ft. long. Std. stem length 24".

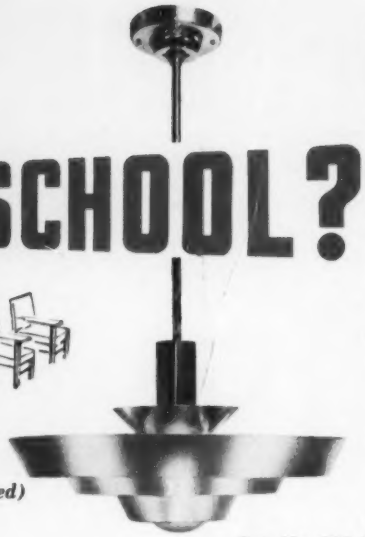
Cat. Series EX

For catalog and price sheets, write or phone today to

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

LIGHTING A SCHOOL?



(Also available ceiling mounted)

Cat. No. 305-A

. . . we suggest the

L & P DELTA CONCENTRIC RINGS

All the quality, tested performance and economy that have earned Light & Power an enviable reputation in fluorescent fixtures are also available in the complete L & P Delta line of incandescent fixtures.

For your next school installation check these features of the Delta Concentric Rings before you select your incandescent fixtures!

1. Tapered heavy gauge anodized aluminum.
2. For 300 to 500 SB Lamp.
3. Swivel aligner—ideal for uneven ceilings.
4. Seamless spun louver ring assembly—18 gauge aluminum.
5. Flanged lower edge of louvers for maximum rigidity.
6. Parts sprayed with heat-resisting lacquer and baked at 375 degrees.
7. Mogul porcelain sockets 250 W/660 V.
8. Wired with 14 gauge slow-burning wire.
9. All-anodized finish guarantees no rust or corrosion, makes units particularly suitable for high humidity or salt air regions.

For catalog and price sheets, write or phone today to

DELTA delta incandescent division

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENN.

Distributed by Wholesale Dealers Only

L&P LIGHT & POWER UTILITIES CORP.

There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

N. B. Nichols
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Little Rock, Arkansas

Craig-Owen
306 E. 11th St.
Chattanooga, Tenn.

C. V. Hammon
845 Southwest 52nd St.
Oklahoma City, Oklahoma

Irving Milew
415 Clover St.
Rochester, New York

W. J. Milner
3627 Peachtree Rd., N. E.
Atlanta, Georgia

J. Louis Weyhing
1914 Rutherford Ave.
Louisville, Kentucky

Irvin Spero
4142 Stillmore Rd.
South Euclid, Ohio

Howard E. Johnson
2976 Randy Lane
Dallas, Texas

Arthur H. Swartz
5003 Kelso St.
Houston, Texas

J. F. Hisserich
2001 Big Bend Ave.
St. Louis, Missouri

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Indianapolis, Indiana

Associated Manufacturers Agents
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2144 Welton St.
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Newell L. Willard
3625 Ivy
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J. A. Goode Company
15842 James Couzens Ave.
Detroit 38, Michigan

Gerald Preacher
1225 Pickens
Columbia, South Carolina

Light & Power Utilities Corp.
1035 Firestone Blvd.
Memphis, Tennessee

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

CABLE, WIRE, AND CORD—Catalog 71A, punched for filing in loose-leaf binder, has been made available by Carol Cable Co., Division of the Crescent Co., Inc., Pawtucket, R. I. Contained in its 24 pages is a complete listing of most of the types of wire and cable offered by the firm.
Write in No. C100 on card, Pg. 19.

ELECTRICAL TAPES—Eight-page Accurate Tape bulletin details data on rubber, friction and plastic tapes. Bulletin features laboratory test results, includes complete packaging information. Immediately available from Accurate Manufacturing Company, Garfield, New Jersey.
Write in No. C101 on card, Pg. 19.

SMALL WIRE STRAPS—Added to the one-hole Viking strap line are three new Midget straps for small wires. The #616 for fastening RX and UF2/14, 2/12, and BX 2/14; the #416 for wires to ¼" OD; and #316 for wires of 3/16" and ¼". These galvanized straps, designed to take several sizes of wires, are featured in literature released by W. W. Cross & Co., Viking Cable and Fastening Devices, Greenville, R. I.
Write in No. C102 on card, Pg. 19.

ELECTRICAL ENCLOSURES — Adjustable and non-adjustable floor boxes, watertight outlets for floor use, and conduit hangers are sthown in the 20-page revised catalog #750 available from Fullman Mfg. Co., Latrobe, Pa. Adjacent to each photograph in the catalog are specifications for the product pictured.
Write in No. C103 on card, Pg. 19.

FUSE CUTOUTS — Extra-heavy-duty fuse cutouts of single-vent. small-bore design are described in detail as to operation, advantages, mechanical loadbreak, dielectric values, and ratings in the 8-page illustrated Catalog EHD 1258 offered by Hubbard and Co., 200 South Michigan Ave., Chicago 4, Ill.
Write in No. C104 on card, Pg. 19.

LINE GUN—A two-color, fold-out bulletin illustrated with step-by-step diagrams points out features and advantages of the line gun manufactured by Jet Line Gun Co., Inc., 730 Seigle St., Charlotte, N. C. Also available are loose-leaf filler-type pages describing contents of the line gun kit and the box adapter kit.
Write in No. C105 on card, Pg. 19.

CONDUIT AND DUCTS—Orangeburg Mfg. Co., Inc., Orangeburg, N. Y., has made available informative literature. Catalog No. 52 includes complete details concerning advantages, installation, and properties of Orangeburg fibre conduit, standard conduit—type I, and Nocrete conduit —type II. Catalog 202 offers specifications, installation data, and diagram of the complete Orangeburg Underfloor duct system. Descriptions and catalog numbers of components are also given.
Write in No. C106 on card, Pg. 19.

CABLE PRODUCTS — Folders, punched for binding filing, and describing four types of Triangle cables have been published by Triangle Conduit & Cable Co., Inc., Triangle and Jersey Ave., New Brunswick, N. J. Products discussed in these folders are the Type RR cable, sheather in Trioprene; asbestos varnished cambric insulated power cables; flexible interlocked armor cable; and control cables.
Write in No. C108 on card, Pg. 19.

HEAVY-DUTY WIRING—Illustrations and detailed descriptions of 27 types of Circle industrial and commercial wiring products are featured in a four-page folder available from Circle Wire & Cable Corp., 5500 Maspeth Ave., Maspeth, N. Y.
Write in No. C109 on card, Pg. 19.

MOTOR STARTERS—Design and construction features of their automatic reduced voltage starters are described in a new bulletin released by Allis Chalmers, Milwaukee 1, Wis. Included is motor control engineered for centrifugal compressors, hammer mills, pumps, large conveyors, large fans, motor-generator sets, and other applications.
Write in No. C110 on card, Pg. 19.

POWER SWITCHES—A new bulletin describing its Type PV power switches, is now available from Line Material Industries, Milwaukee 1, Wis. The bulletin gives complete information on switches rated at 600 or 1200 amperes and having voltage ratings from 7.5 kv to 69 kv.
Write in No. C113 on card, Pg. 19.

TRANSFORMER HOIST— Literature is now available from Morrison-Pelsue Co., 2001 S. Bannock St., Denver 23, Col., describing the MoPeCo Transformer Hoist—a time saving device that permits hanging up to three transformers in thirty minutes.
Write in No. C114 on card, Pg. 19.

UNDERFLOOR DUCT— Formerly known as Howarduct, the Spang Standard Underfloor Duct, is introduced by the Spang-Chalfant Division of the National Supply Co., Two Gateway Center, Pittsburgh, Pa., in an eight-page, illustrated bulletin featuring its simplicity in the distribution systems for electric power, telephones, and inter-coms.
Write in No. C115 on card, Pg. 19.

CIRCUIT BREAKER PANELBOARD—A descriptive folder featuring Quicklag lighting circuit panelboards is available through Frank Adam Co., 3650 Windsor Pl., St. Louis, Mo. This folder includes illustrations, ampere capacities, voltage ratings, and all internal construction features of these panelboards.
Write in No. C116 on card, Pg. 19.

ADEQUATE WIRING — "Bright Ideas for Ladies" is the title of a new booklet from American Metal Mould-

(Continued on page 28)

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The Electric League of Charleston. Guilford C. Smith, Secretary-Treasurer, c/o Appalachian Electric Power Co., P. O. Box 1986, Charleston 27, W. Va.

Central West Virginia Electrical League, Inc. J. R. Waters, Secretary, P. O. Box 1392, Fairmont, W. Va.

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Southeastern Electric Exchange. John W. Talley, Managing Director, 303 Haas-Howell Bldg., Atlanta, Ga.

The Maryland Utilities Association. Robert L. Smith, Secretary, Frederick, Md.

Oklahoma Utilities Association. Miss Thelma T. Jones, Secretary, Suite 2415, Oklahoma Biltmore Hotel, Oklahoma City 2, Okla.

Public Utilities Association of the Virginias. R. W. McKinnon, Executive Secretary, 602 First Federal Bldg., Roanoke, Va.

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National Association of Electrical Distributors. Arthur W. Hooper, Executive Director, 290 Madison Ave., New York 17, N. Y.

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Electrical Equipment Representatives Association. Cy W. Sward, Executive Director, 1675 Fifth St., Clermont, Fla.

Electrical Manufacturers Representatives Association, Inc. George E. Clements, Secretary, 722 Stevenson Lane, Towson 4, Md.

Electrical Manufacturers' Representatives of Virginia, Inc. C. F. Bennett, Secretary, 205 West Grace St., Richmond 20, Va.

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Shelby County Electrical Contractors Assn. A. M. Scruggs, Sr., Corresponding Secretary, 58 Buntyn St., Memphis 11, Tenn.

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National Electrical Contractors Association. Clint J. Harder, Secretary-Treasurer, 1200 18th St., N.W., Washington 6, D. C.

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NECA, Kansas Chapter. Charles W. Paige, Manager, 416 Central Bldg., Topeka, Kan.

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NECA, Louisville Chapter. J. C. Snyder, Manager, P. O. Box 1685, Louisville 8, Ky.

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NECA, Florida East Coast Chapter. J. H. Jackson, Manager, 519—25th St., West Palm Beach, Fla.

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IAEI, Virginia Chapter. A. M. Miller, Secretary-Treasurer, 910 West 30th St., Richmond 25, Va.

IAEI, West Virginia Chapter. Robert E. Wilson, Secretary-Treasurer, P. O. Box 626, Charleston 22, W. Va.

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NISA, Mid-Atlantic Chapter. John R. Lange, Jr., Secretary, 3005-07 Greenmount, Baltimore, Md.

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KRALOY...

FIRST PVC RIGID CONDUIT INSPECTED AND PASSED BY UNDERWRITERS LABORATORIES!

Only KRALOY, yes *only* KRALOY, among all plastic conduits, now carries U-L listing — another first for KRALOY! High impact KRALOY PVC (Polyvinyl Chloride) RIGID CONDUIT... the *lifetime* conduit... the *perfect* conduit... won't rust, won't pit, won't corrode, won't support combustion, is non-magnetic and non-sparking. KRALOY needs no paint, no coating, needs no lining, and its mirror-smooth inside wall makes fishing easier than with any other type of conduit. Add these outstanding features to KRALOY's extreme light weight (see chart below) and you have the *ideal* conduit... ideal for direct burial and slab work. Installation costs can be cut *drastically* with light weight KRALOY PVC RIGID CONDUIT. Consider the dollars to be saved in handling and installing U-L listed KRALOY CONDUIT Cat. No. KE-1058 versus steel, *versus even aluminum conduit:*

KRALOY PVC CONDUIT is sold only through wholesale electrical supply houses.

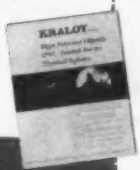
NOTE WEIGHT COMPARISON — KRALOY PVC vs. ALUMINUM vs. STEEL CONDUIT

U.L. required minimum weight per 100 ft. including couplings, lbs.

K-59-29

Trade Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
KRALOY PVC	15.0	20.0	29.0	40.0	47.0	63.0	101.0	131.0	159.0	187.0	253.0	326.0
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

For complete information on KRALOY PVC CONDUIT and installation directions, mail the coupon or write to Kraloy Plastic Pipe Co., Inc., 4720 East Washington Blvd., Dept. **ES-11**, Los Angeles 22, Calif.



NO CONDUIT REPLACES **KRALOY**

Kraloy Plastic Pipe Co., Inc., Dept. ES-11
4720 East Washington Blvd., Los Angeles 22, Calif.

Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

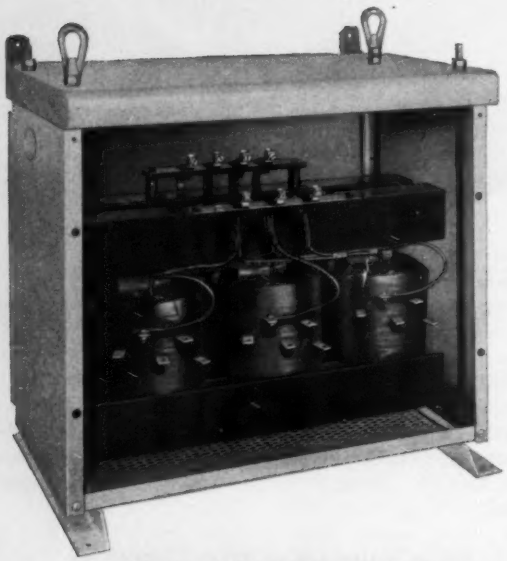
Name_____

Address_____

City_____ Zone____ State____

When you select dry-type transformers initial costs can be false economy

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS



45 Kva 3-phase transformer with taps. Interchangeable wall or floor mounting. Front panel removed, showing interior.

COMPLETE LINE FOR EVERY PURPOSE up to 10,000 Kva, up to 15,000 volts, including special transformers and saturable reactors.

The same quiet SORGEL transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any electrical manufacturer.

The first cost of dry-type transformers is not always the final cost. Don't be misled; the lure of lower prices often camouflages operating and installation costs. SORGEL SOUND-RATED DRY-TYPE TRANSFORMERS are designed and constructed for long life. They provide the absolute ultimate in operating efficiency, ease of installation, overload capacity and long-range economy.

SORGEL offers these proven advantages

LOWER COPPER LOSS — Coils are liberally designed for the most effective use of the latest developments in insulating materials, have large air ducts for low hot spot temperature and are vacuum-impregnated to provide a co-ordinated insulation system.

LOWER CORE LOSS — Cores are designed with the industry's lowest magnetic flux densities, resulting in low core loss and the lowest sound level. The entire unit is secured within a substantial frame. Large units are mounted on vibration dampers to minimize vibration transmission to adjacent areas.

QUICKER AND EASIER INSTALLATION — The enclosure is self-supporting and entrance can be made on sides, top, bottom or back. Connecting is made easier by means of solderless connectors on terminal blocks in roomy connection compartments. Units up to 75 Kva single phase and 45 Kva 3-phase, are furnished for interchangeable wall or floor mounting.

Over 43 years experience in the development, manufacturing and application of transformers, has made these achievements possible.

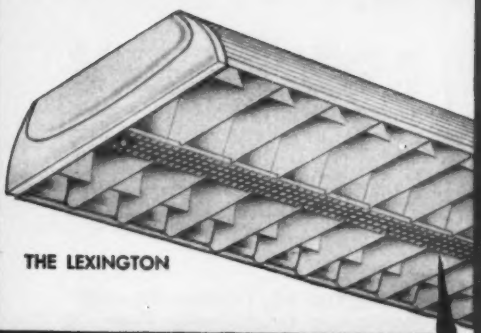
You will be doing your company or customer a great service when you select the best dry-type transformer made only by . . .

Sorgel Electric Company

835 W. National Avenue, Milwaukee 4, Wisconsin

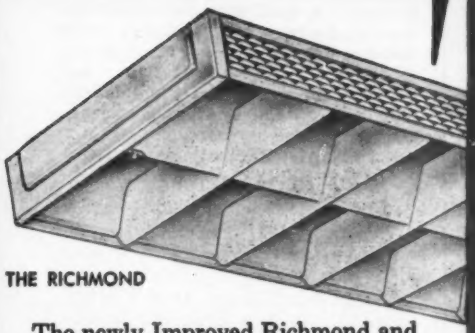
Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.



THE LEXINGTON

New Improved RICHMOND and LEXINGTON ... at New, Low Prices



THE RICHMOND

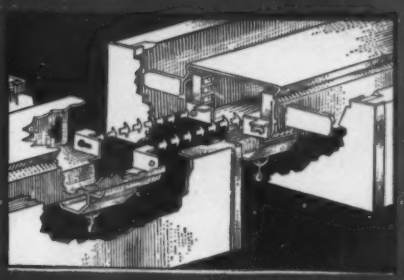
The newly Improved Richmond and Lexington Series by Miller offer outstanding Values for lighting Schools, Offices, and Stores.

Four exclusive *installation and maintenance features* have been built into all units in both series. *Prices for most types are at new lows*, while illumination performance remains high as ever. And, these new fixture groupings have an even trimmer, more modern appearance.

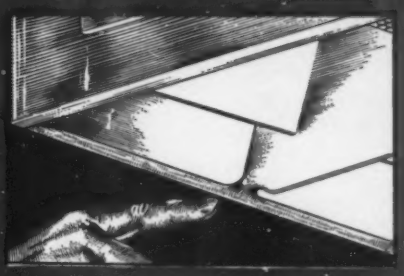
You can choose between 45° x 45° or 35° x 25° shielding for both series; 2 or 4 Lp., 40W Rapid Start or 8 ft. Slimline. 2 Lp. Richmonds and Lexingtons also available for 800 MA High Output lamps. *Power-Groove* operation is a brand new option for the 2 Lp. Richmond.

For complete catalog and price information write Dept. RL-119. For a physical demonstration contact your Miller Representative, or your Miller Distributor.

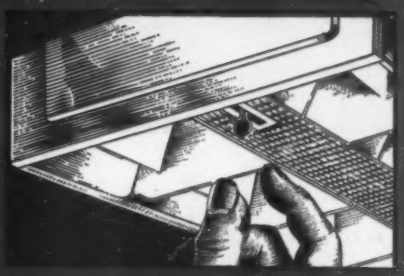
New Exclusive Features



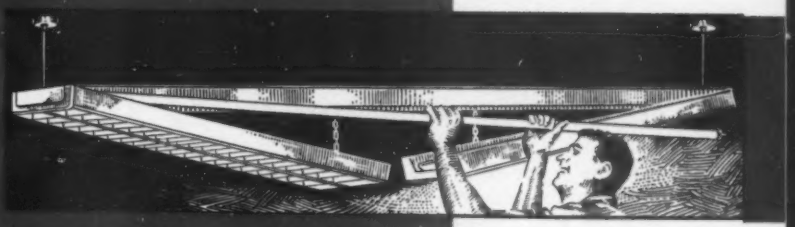
Easy channel connection and accurate horizontal alignment assured by built-in key slot connector and aligning tabs.



Sturdy, one piece cross louver construction assures rigid, rattle free shielding assembly.



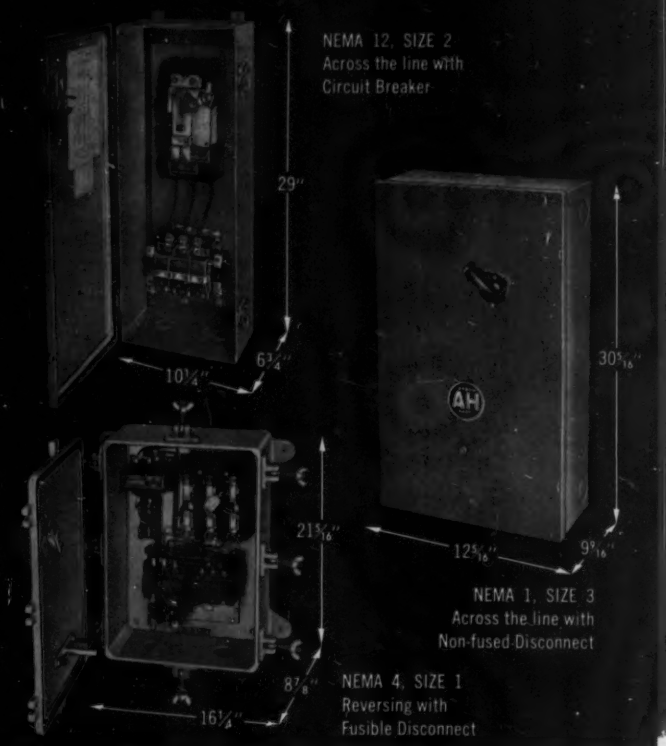
Shielding assembly is securely locked in position (or lowered on safety chains) by quarter turn of visual action thumb latches.



Suspended 8 Ft. units can be easily relamped from single ladder position.

THE **miller** COMPANY
MERIDEN, CONNECTICUT

miller
SINCE 1844



Announcing: **A COMPLETE LINE OF COMPACT, LIGHTWEIGHT COMBINATION STARTERS**

Sizes 0, 1, 2, and New Sizes 3 and 4—and NEW CAST ALUMINUM WEATHERPROOF and EXPLOSIONPROOF ENCLOSURES

Starters are of exclusive "Right Angle" Design which brings important installation, maintenance and performance benefits. For convenience and safety, unit is front operated by means of Fused or Unfused Disconnect, or Circuit Breaker. Circuit Breakers are Instantaneous or Thermal Magnetic Trip Types. *No other line offers enclosures that facilitate mounting and handling like the new cast aluminum NEMA 4 Weatherproof and NEMA 7 and 9 Explosionproof – Enclosures that are one-half the weight of old-style cast iron boxes.* Other available enclosures: General Purpose (NEMA 1) and Industrial (NEMA 12 – oil-tight and dust resistant).

Write for new folder on A-H Combination Starters to: The Arrow-Hart & Hegeman Electric Company, Dept. ES, 103 Hawthorn St., Hartford 6, Conn.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

ARROW AH HART

ing Co., 146 Coit St., Irvington 11, N. J. The booklet was prepared by the Armoured Cable Section of the National Electrical Manufacturers Association to acquaint homemakers with the electrical wiring their homes need for full electrical living now and in the future.

Write in No. C119 on card, Pg. 19.

ELECTRICAL TAPES— Plymouth Rubber Co., Inc., Canton, Mass., is offering a new catalog on friction, rubber, and plastic tape. The full color folder gives descriptions, sizes, and packing information on their complete line of Slipknot electrical insulating tapes. Detailed specification data charts are included in the 6-page bulletin.

Write in No. C120 on card, Pg. 19.

SATURABLE REACTORS — This efficient method of regulating and controlling electric power for various manufacturing processes is described in a new folder available from Sorgel Electric Co., 838 West National Ave., Milwaukee 4, Wisc.

Write in No. C121 on card, Pg. 19.

ELECTRIC HEATING — Electromode Division of Commercial Controls Corp., 570 Culver Rd., Rochester 3, N.Y., is now offering their complete line of electric heaters and heating systems for the home. Descriptions, specifications and illustrations are included for wall and portable heaters for large and small rooms, radiant panel heaters, baseboard heaters and radiant cable heat.

Write in No. C122 on card, Pg. 19.

LIGHTING FIXTURES — A new catalog of recessed lighting fixtures has been released by Atlas Electric Products, 319 Ten Eyck St., Brooklyn 6, N. Y., manufacturers of Atlite lighting equipment. The 24-page, color catalog features over 100 new lighting fixtures that have been added to the Atlite line.

Write in No. C123 on card, Pg. 19.

PIPE BENDERS—Lidseen, of N. C. Inc., 1000 First St., Hayesville, N. C., offers a new revised folder which illustrates the complete line of Lidseen "Chicago" pipe benders featuring the calibrated degree scale for making accurate bends with ease. The folder includes prices of units and parts.

Write in No. C124 on card, Pg. 19.

TIME SWITCHES—A general catalog, TS-89, available from Interna-

tional Register Co., 2620 West Washington Blvd., Chicago 12, Ill., describes their complete line of time switches. Also available is a market catalog sheet, TS-138, that gives specific information on how Intermatic time switches can be used in connection with swimming pools.

Write in No. C125 on card, Pg. 19.

DISTRIBUTION EQUIPMENT — Kuhlman Electric Co., P. O. Box 288, Birmingham, Mich., offers an eight-page catalog, CS-201, describing their line of distribution transformers of the single phase conventional type, 167 kva and below. Also available is an information sheet, CS-204, on the Kuhlman externally operated series-multiple switch for pole-type transformers 5-167 kva.

Write in No. C126 on card, Pg. 19.

VENTILATING FANS — Hunter Division of Robbins & Myers, Inc., Memphis 14, Tenn., announces their new catalog, Form No. V-591, on their line of home ventilating fans. The two-page booklet contains the features, specifications, and dimensions of R&M-Hunter fans for attic and basement installation.

Write in No. C127 on card, Pg. 19.

LAMP GUIDES — Sylvania Lighting Products, 60 Boston St., Salem, Mass., offers a series of guide books containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. C128 on card, Pg. 19.

FASTENING DEVICES — The Paine Co., 501 Westgate Rd., Addison, Ill., offers a new catalog on their line of hanging and fastening devices. The 31-page bulletin is indexed for easy reference, and contains information on design features, prices, and packaging.

Write in No. C129 on card, Pg. 19.

WIRING EQUIPMENT— Keystone Manufacturing Co., 23328 Sherwood Road, Warren, Mich, has issued a new catalog (158 March 1, 1958) giving complete specifications and illustrations on their line of wiring installation equipment. Included in the 70-page catalog are wireways and auxiliary fittings, cutout boxes, outlet boxes, switch boxes, and cabinets, giving Code requirements, and price sheets.

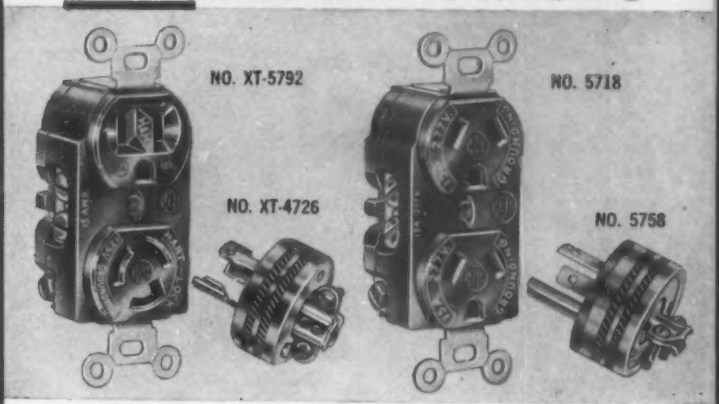
Write in No. C130 on card, Pg. 19.

ELECTRICAL FITTINGS—A wide range of lugs, terminals, crimping

(Continued on page 30)

ARROW AH HART

AGAIN! From ARROW-HART NEW SAFETY FIRSTS



COMBINATION 3-WIRE GROUNDING HART-LOCK RECEPTACLES and CAPS, 15 AMPS, 125 VOLTS.

One side of this combination receptacle is 3-wire grounding Hart-Lock with 2 green hex ground screws and the other side is conventional 3-wire, 2-wire grounding 15 amps, 125 volts. Where limited space requires a duplex receptacle to provide both grounding and accidental disconnect protection and conventional U-shape grounding.

3-WIRE DUPLEX GROUNDING RECEPTACLES and CAPS—15 AMPS, 277 VOLTS.

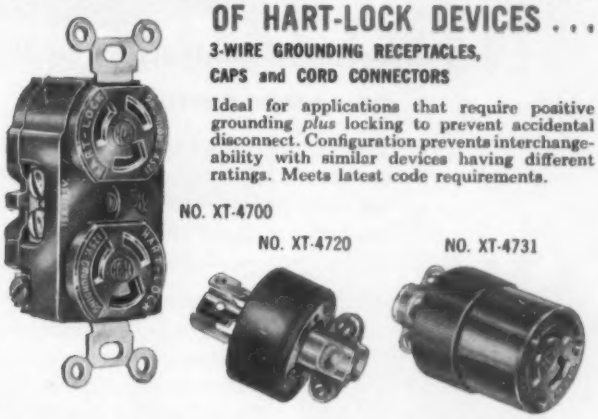
New from A-H, this line of wiring devices is specifically designed to provide new standards of safety and dependability for industrial and commercial fluorescent lighting fixtures of the disconnecting type that operate on 227 volts.

"H & H" Specification Grade

. . . AND A NEW ADDITION TO OUR LINE OF HART-LOCK DEVICES . . .

3-WIRE GROUNDING RECEPTACLES, CAPS and CORD CONNECTORS

Ideal for applications that require positive grounding *plus* locking to prevent accidental disconnect. Configuration prevents interchangeability with similar devices having different ratings. Meets latest code requirements.



These new wiring device lines offer new opportunities to build your reputation and your business by providing electrical safety and dependability for your customers. Act now to take advantage of these opportunities. Write today for complete catalog data and ordering information.

Dept. ES, The Arrow Hart & Hegeman Electric Co.
103 Hawthorn St., Hartford 6, Conn.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

. . . by more contractors than any other portable cord

The cord that clicks with contractors is ROYAL . . . and the reasons are many. Made to high standards of quality, and controlled every step of the way under one roof, Royal cords offer the quality characteristics that you look for most in your work — flexibility, durability and dependability.

Royal offers the most complete range of types and sizes, too, through your electrical wholesaler; one recognized and respected name on all your flexible cord — Rubber, Neoprene and Plastic Jacketed Portable Cords, Thermostat Cable, Lamp and Fixture Wires, Machine Tool Wires, and heavy duty "POWR-KORD" extensions.

Next time you order cords, specify ROYAL.

Royal Electric Corporation
Pawtucket, Rhode Island

ROYAL ELECTRIC ...an associate of UL

REPRESENTATIVES:
Cary Chapman & Co., Atlanta—New Orleans—Greensboro—Birmingham
Suckman & Coulters, Inc., Miami
NuRe Company, Houston—Dallas—San Antonio

tools, connectors and other fittings for wire and cable are described in the electrical catalog available from H. B. Sherman Mfg. Co., Battle Creek, Mich. Complete information is included in the catalog.

Write in No. C132 on card, Pg. 19.

INDUSTRIAL FIXTURES—A four-page, two-color catalog, made available by All-Brite Fluorescent Fixture Co., 352 Shaw Rd., South San Francisco, Calif., describes its Deluxe industrial fixtures, series 80 and 81. Special features and specifications of the fixtures are included in the catalog.

Write in No. C133 on card, Pg. 19.

THERMOSTATS— White-Rodgers, 1209 Cass Ave. St. Louis 6, Mo., has recently issued a booklet describing their electric heat thermostats. It contains information on design features, catalog data, and applications, stressing the decorator styling of the thermostats. The booklet is illustrated and in full color.

Write in No. C134 on card, Pg. 19.

WIRING DEVICES—Slater Electric and Manufacturing Co., Inc., Glen Cove., L. I., N. Y., has made available a catalog including complete information on their lines of appliance switches, lampholders, power outlets, receptacles, switches, weatherproof devices, wall plates, and automatic kloz-a-lite.

Write in No. C135 on card, Pg. 19.

FREIGHT COMPUTER — Pittsburgh Standard Conduit Co., Verona, Pa., announces a four-page bulletin for computing freight charges on rigid steel conduit. The bulletin is useful in figuring freight to jobs and warehouses.

Write in No. C136 on card, Pg. 19.

CONDUCTORS — The Seal Wire Co., Shelby, N. C., announces the availability of a new price list on copper coated steel-copper conductors.

Write in No. C137 on card, Pg. 19.

BOXES AND TROUGHS—Catalog No. 8 has just been issued by Circle A-W Products Co., P. O. Box 1171, Modesto, Calif., distributors for products manufactured by Alwalt Mfg. Co., of Modesto. This 44-page covers a wide range of wiring gutter and fittings, meter troughs, meter and breaker assemblies, and a wide range of boxes of various types.

Write in No. C138 on card, Pg. 19.

(Continued on page 34)

with
Square D
Lay-in Duct
you can---

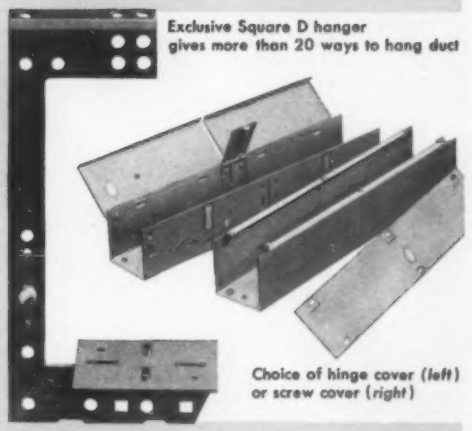
INSTALL WIREWAYS FASTER AND AT MUCH LESS COST!

Before you decide to install conduit on a job, check to see if you shouldn't be using *Lay-in Duct* instead. Experience shows that in 1 out of 7 cases, the job can be done faster and at substantially less cost with *Lay-in Duct.*

Not only that, but *Lay-in Duct* makes it easy to add extra circuits later on, makes machinery circuits readily accessible, makes it simple to modify layouts. *Lay-in Duct* is completely reusable, requires less labor on multiple circuits.

You get extra advantages when you use SQUARE D *Lay-in Duct.* You can choose from two types—hinged cover or screw cover—and from the most complete line of fittings available. All fittings can be used with either type. You get the fastest installation—quick couplings. The exclusive Square D hanger gives exceptional flexibility—provides more than 20 ways to hang Square D wireways. You get real rigidity, too—joint design triples duct strength. Available in four sizes—2½, 4, 6 and 8 inches.

Write for Lay-in Duct literature. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan



Exclusive Square D hanger gives more than 20 ways to hang duct

Choice of hinge cover (*left*) or screw cover (*right*)

SQUARE D COMPANY

—wherever electricity is distributed and controlled

The highest mountain on the North American continent is Mount McKinley in our 49th State, Alaska. It towers 20,300 feet above sea level and rises higher above the surrounding country than any other mountain in the world. Bronco 66 Certified is first choice for use in these freezing, rocky heights because the high Neoprene content in the jacket gives it unexcelled flexibility in cold weather as well as maximum abrasion resistance.

BRONCO 66 Certified NEOPRENE

PORTABLE ELECTRICAL CORD AND CABLE

has the HIGHEST NEOPRENE content in the industry

...at no extra cost. Outer protecting jacket contains not less than 67.32% Neoprene and is so certified by a Registered Professional Engineer. When you buy Bronco 66 Certified, you get the most Neoprene for your money... hence, maximum protection from oil, acids, alkalis, heat, cold, flame. Always specify Bronco 66 Certified and enjoy the long term economy of top quality.

Self-measuring jacket is branded every two feet by a patented Bronco process — U. S. patent No. 2867001. Complete identification is molded into the jacket so it won't rub off.

Buna rubber insulation is built to exceed ASTM D-755 test requirement. Jacket and insulation are Synchro-Cured, the exclusive Bronco process of vulcanization, to work as an indefatigable team.

WRITE FOR FREE SAMPLE! → **WESTERN INSULATED WIRE CO.**
Los Angeles 58, California

Bronco Representatives in the South: FLORIDA, John R. Collins & Associates, P. O. Box 26, Tampa 1; GEORGIA, Frank B. Davis, 708 Spring St., N. W., Atlanta 8; KENTUCKY, Fultz & Company, 2621 Valletta Road, Louisville 5; LOUISIANA, Dupont-Wachter Co., 609 Tchoupitoulas, New Orleans 12; NORTH CAROLINA, G. M. Hogshead Co., 201 W. Worthington, Dillworth, Charlotte 3; TENNESSEE, Ross D. Thomas Co., 198 So. Main St., Memphis; TEXAS, Jack Morgan Co., Inc., 1013 Slocum St., Dallas 7; J. O. Bell, Jr., 3110 Eastside Street, Houston 27; VIRGINIA, Lee A. Roach, 5010 New Kent Rd., Richmond 25.

EASIER TO DO... and costs less too!

B-M

INDENTER FITTINGS and TOOLS

Here is the combination that is unbeatable when it comes to easier E.M.T. installation at less cost. New lightweight plier size indenters make setting up thin wall conduit a breeze. B-M fittings are neater too! No unsightly nuts or projecting set screws.

A few more of the plus features of B-M fittings are Concrete tight—Vibration resistant—Extra heavy bright zinc plate, salt spray and acid drip tested for corrosion resistance—Extra heavy positive bonding locknuts—Smooth rounded edges or bushed throat type connectors that prevent insulation damage—All steel construction with extra heavy gauge wall thickness.

Red Throat
BM-21B
½" Connector

Red Throat
BM-22B
¾" Connector

Red Throat
BM-23B
1" Connector

BM-41
½" Coupling

BM-42
¾" Coupling

BM-43
1" Coupling

BM-51
½" Offset Connector

BM-21
½" Connector

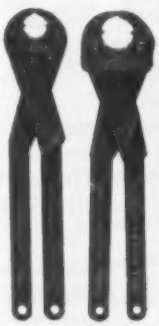
BM-22
¾" Connector

BM-23
1" Connector

BM-No. 600
Changeable Jaw Indenter

BM-No. 1000
Handvise for ½", ¾" and 1" E. M. T.

BM-No. 100
Cutter for ½", ¾" and 1" E. M. T.



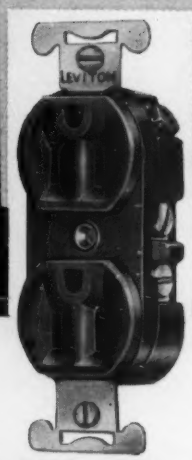
BM-No. 607
½" Indenter
BM-No. 608
¾" Indenter

UL

TELESCOPE BM SYSTEM

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS



No. 5014
U-ground duplex
power outlet.
One of a full
line of U-ground
devices for every
residential,
commercial and
industrial use.

ANOTHER IMPORTANT STRUCTURE USING SPECIFICATION GRADE

LEVITON

Wiring Devices

ARCHITECTS, ELECTRICAL ENGINEERS, ELECTRICAL CONTRACTORS everywhere specify Leviton. You, too, can take advantage of Leviton's complete line of Specification Grade wiring devices. Investigate this comprehensive line yourself! Sold thru authorized electrical distributors.

FOR FULL INFORMATION AND CATALOG WRITE TO:

LEVITON

LEVITON MANUFACTURING COMPANY • BROOKLYN 22, N. Y.

Chicago • Los Angeles • Leviton (Canada) Limited, Montreal

For your wire needs, contact our subsidiary: AMERICAN INSULATED WIRE CORPORATION

LIGHTING CONTROL — The Arrow-Hart and Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., offers a one-page information sheet on their new quiet, tap action, lighting contril switeh, designed to fit any standard toggle wall plate.

Write in No. C139 on card, Pg. 19.

FITTINGS AND FIXTURES — Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

Write in No. C140 on card, Pg. 19.

ELECTRICAL BOXES—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.

Write in No. C141 on card, Pg. 19.

STEEL WIRE—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building, Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.

Write in No. C142 on card, Pg. 19.

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.

Write in No. C143 on card, Pg. 19.

CONSTRUCTION ANCHORS — "Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.

Write in No. C144 on card, Pg. 19.

SERVICE PANELS — Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

Write in No. C145 on card, Pg. 19.

(Continued on page 38)

HERE ARE 11 GOOD REASONS WHY SPANG STEEL CONDUIT IS YOUR BEST BUY

1. **High strength** . . . SPANG Conduit resists crushing and mechanical injury from rough treatment at job site better than other types of raceways.

2. **Uniform throughout** . . . bends easily . . . no hard or soft spots . . . quickly and accurately threaded . . . saves installation time.

3. **Smooth interior finish** . . . uniform hard surfaces for easy, trouble-free wire pulling. No obstructions, no burrs to damage wires.

4. **Exceptional corrosion resistance** . . . hot-dipped, heavy-duty galvanized finish and lacquer coating are highly resistant to moisture, cracking, peeling or flaking. No special coating needed for embedding in concrete.

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6. **Vibration resistant** . . . combination rigid steel conduit, threaded couplings and fittings is inherently strong and vibration resistant.

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8. **Tested and inspected** . . . Preece Test and bending test applied to samples from each lot. Each length inspected for uniformity and straightness.

9. **Color coded for size identification** . . . colored thread protectors on each length of conduit save you time in inventory, at job site.

10. **Bundled with steel strapping** . . . in sizes ½" through 1½" for added safety and convenience in handling, transporting, storage.

11. **Approved** . . . by Underwriters' Laboratory, Inc. Meets all Federal and ASA specifications.

That's the story on SPANG Steel Conduit. But best way to prove that SPANG is your best conduit buy is to try it on your next installation. Your local SPANG Distributor will be glad to serve you. Give him a call!

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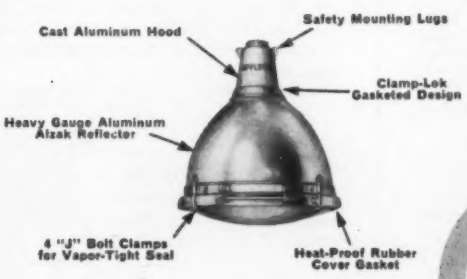
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Safety Mounting Lugs
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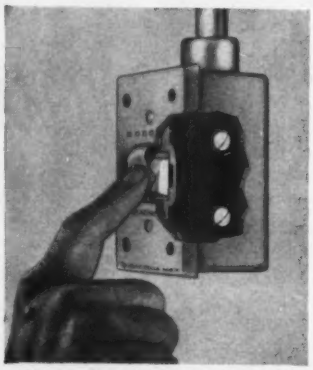
*INSULPRENE PLATE and A.C. pressSwitch COMBINATION

Introducing a combination unit—complete in one box—including weatherproof "Insulprene" plate and A.C. "Presswitch"... designed for all general outdoor applications: shipping areas, parking lots, gas stations, breezeways, etc. The weatherproof "Insulprene" plate fits both FS and standard wall boxes. The combination is available with 15 or 20 amp. "Presswitch" either single pole, double pole, 3-way or 4-way. "Insulprene" plate resists oil, hot water, live steam, extreme cold, grease, etc.



Cut-away shows A.C. "Presswitch" mounted in FS box and protected by new Weatherproof "Insulprene" Plate.

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

*made of DuPont Neoprene

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Los Angeles 12, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

IN CANADA:
Scarborough, Ontario,
1160 Birchmount Road

ELECTRICAL FITTINGS—Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. C146 on card, Pg. 19.

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St. Cleveland 11, Ohio.
Write in No. C147 on card, Pg. 19.

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I., covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.
Write in No. C148 on card, Pg. 19.

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.
Write in No. C149 on card, Pg. 19.

POWER BENDER — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.
Write in No. C150 on card, Pg. 19.

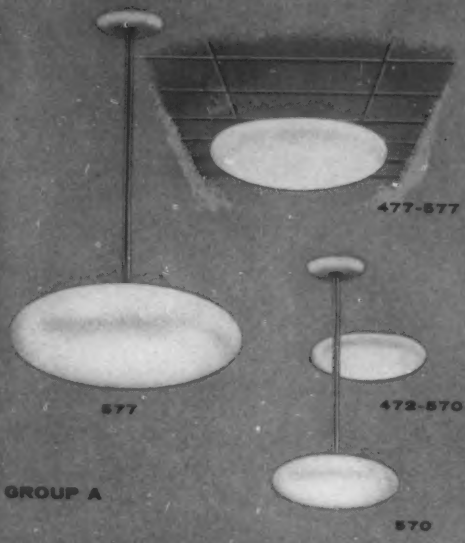
ELECTRICAL EQUIPMENT—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their line of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.
Write in No. C151 on card, Pg. 19.

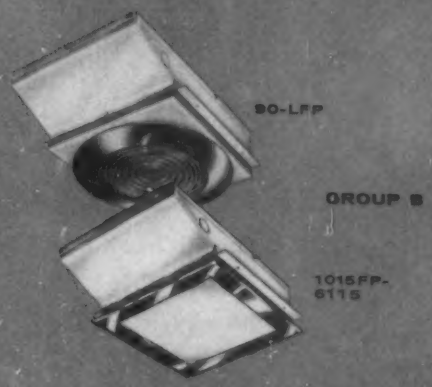
SELECTING FUSES — A 12-page descriptive handbook Fuseology tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. C152 on card, Pg. 19.

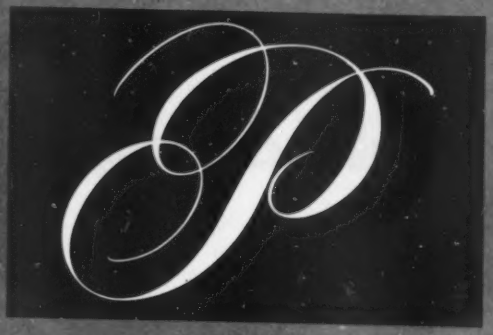
A Few Lighting Fixtures from the **PRESCOLITE** *NEW PRODUCT PARADE*

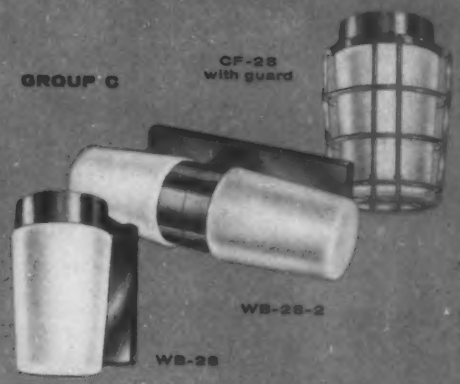
Group "A" "Satellite"—a new departure in beautiful, hand blown "Thermopal" glass used with pendant fixtures or on recessed housings.

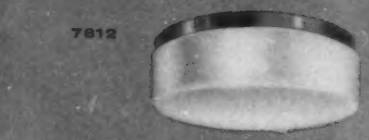
Group "B" A new concept in recessed lighting for specific use in concrete construction.



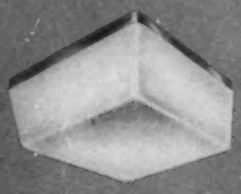








GROUP D



Group "C" The original weather proof, "Dielux" diecast aluminum bracket and ceiling lights now in 150-200 watt sizes. Hand blown "Thermopal" glass. Available with diecast aluminum guard.

Group "D" Round and Square Drum fixtures with hinged "Dielux" diecast canopy. Hand blown "Thermopal" glass.

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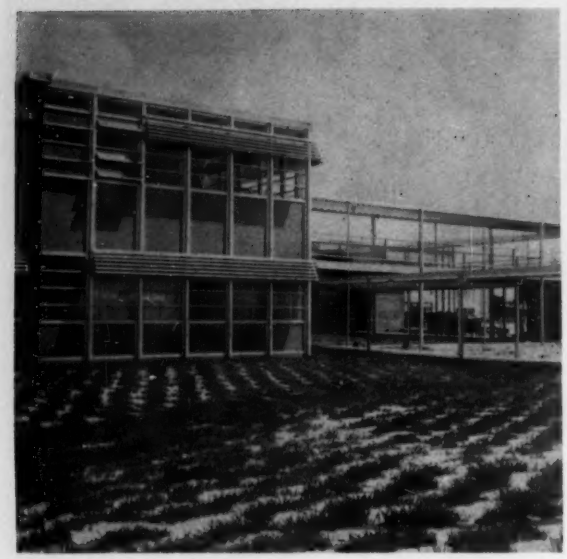
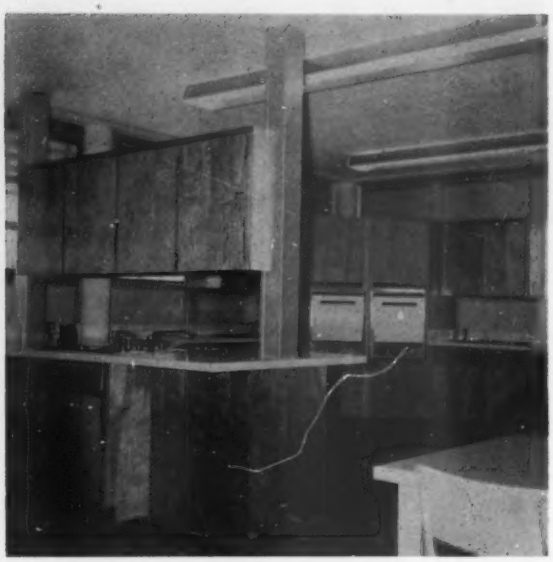
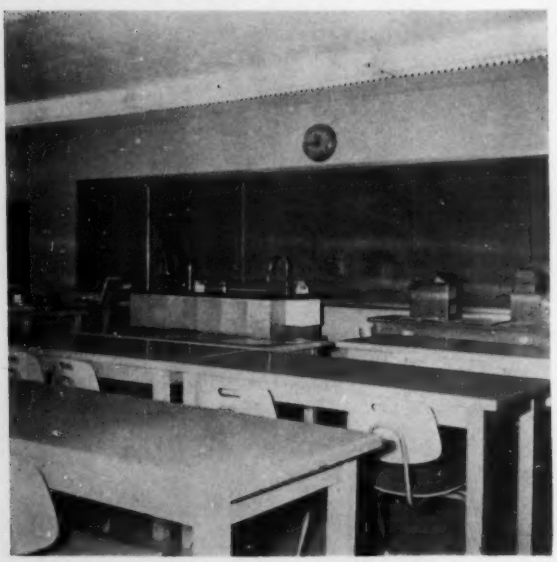


Administration building, Madeira Junior High School.



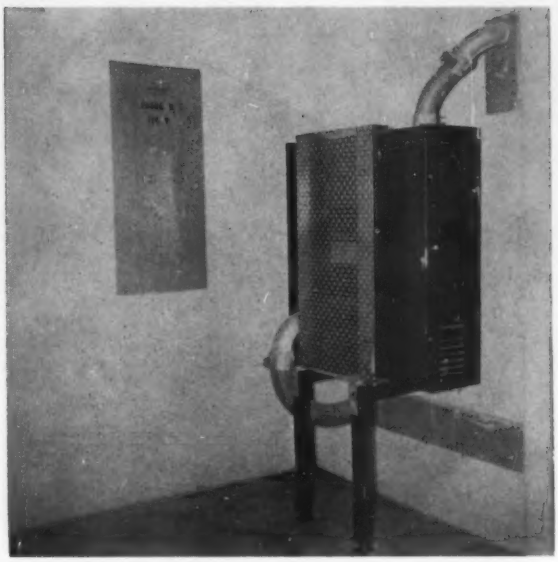
All-electric kitchen in home economics class.

Wiring school for 480 volts leads to substantial savings



Modern, well equipped science classroom.

Fluorescent large area lighting in the gymnasium.



Load center in the industrial arts building.

Transformer, line switches, load gutter in cafetorium.

By Victor W. Kuhl, Jr.
Consulting Engineer
St. Petersburg, Fla.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers
- Consulting Engineers ✔

◆ THE RECENT trend toward campus-type planning for junior and senior high schools poses a real problem in the designing of distribution systems for electricity and for mechanical piping. Naturally, this type of building layout increases the cost of work done by the mechanical trades, but fortunately an electrical system can be designed to stay within normal construction costs without sacrificing flexibility or capacity.

Such an electric system was designed for Madeira Junior High School, constructed on sand pumped in from the bottom of adjacent bay waters near Madeira Beach, St. Petersburg, Fla.

A study of the plot plan for this school revealed the logical load center to be a distance of 540 feet from the gym, 260 feet from the administration building, 260 feet from the new cafetorium and existing elementary cafeteria and classrooms. Other buildings are 70 feet to 100 feet away. In view of the distances involved and probable future expansion, a 480/277-volt wye system was recommended and accepted by the County School Board architect James R. Barnes.

Building layout

Physically the building layout consists of two 2-story, 8-classroom buildings; one 2-story industrial arts building with shop, all-electric kitchens, sewing room, and drafting room; one cafetorium complete with stage; one gymasium with locker rooms; and 2-story covered passageways between 2-story buildings with stairways at the central toilet area and at two other locations. The existing all-electric kitchen load and the elementary school is fed from the new 480-volt service located under the stairs at the toilet building.

In order to take advantage of a 120/208-volt system (the standard school equipment voltage), the 480 volts is reduced by 3-phase dry type transformers to 3-phase 120/208 volts at each building. Fluorescent lighting incorporates 277-volt ballasts fed from separate 3-phase, 4-wire lighting panels in each building; while incandescent hall lighting, appliances, office equipment, and shop motors are fed through dry type transformers at 120/208 volts.

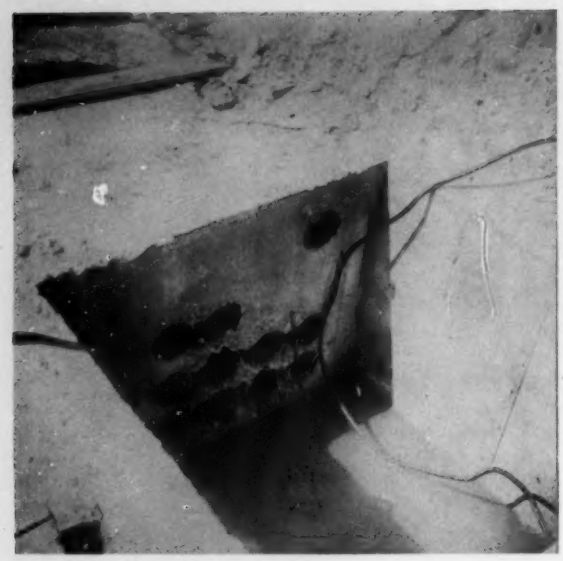
Fluorescent large area lighting in the gym and industrial arts buildings is controlled by master low voltage remote control nine position switches centrally located to operate ganged 277-volt relays. Incandescent lighting in covered passageways is controlled locally and from a central location using the same low voltage method.

All service is taken at 480 volts from a Florida Power Corporation vault. The cafeteria kitchen is metered separately. The rest of the load is fed by a 600-ampere main having a nominal rating of 500 kva. Current limiting fuses are installed in the main switch and in the main fused distribution panelboard. All lighting and power panels are of the circuit breaker type. The 480-volt feeders are fused with current limiting fuses rated at 200 amps or less to afford short circuit protection to lighting panels.

It is interesting to note that 500 kva capacity would require 1395 amps or a 1600 amp main at 208 volts.

Comparative cost summary

The comparative cost summary was derived from estimating figures used by the Gabrio Electric Co., of St. Petersburg, and from comparative equipment costs furnished by the Square D Co. No attempt was made to evaluate the savings in branch circuit wiring. These comparative costs are shown



Concrete handhole cast in the field.

Conduits stubbed at main service center.

in the accompanying tabulation.

An underground system between buildings was selected and designed for ease of installation and of future expansion. Construction has already begun on one additional 2-story, 8-classroom building. Future planning indicates at least one more building of this type. Bituminous fiber duct encased in concrete is used for power and signal raceways with field constructed concrete handholes installed at strategic locations. A rigid metallic raceway is provided for future closed circuit television cable and may be used currently for a central antenna system. Educational television has already made its debut in this area.

The electrical design utilizes a central grounding system comprised of a separate ground conductor connecting the power company neutral, the water system, the ground electrode in each handhole, each transformer, and each metallic conduit system at each building.

This school has a complete 2-way sound system from the administration building to each classroom or activity area. Separate call and return may be made to each location or an all-points call may be used. In addition to this, a separate emergency alarm system is installed with remote call stations, with emergency horns located for the best sound coverage, and with a supervised non-coded main control panel.

General class room lighting was designed for a maintained 35 footcandles. The fixtures are two lamp eight foot slimlines with 45 x 45 degree shielding and plastic side panels.

The 480-volt system saved an estimated $15,000 at 2% voltage drop or 17% of the electrical contract when compared to the 208-volt system. This amounts to a savings of approximately $30 per kva of installed capacity.

A preliminary study showed that the following criteria were met for the application of this system:

(1) Load make-up—at least one-third of the load could utilize 480 volts or 277 volts.

(2) Load magnitude—total load was at least 200 kva with primary service available.

(3) Length of feeders—feeders averaged 200 feet or more making the 480-volt system more economical regardless of (1) above.

Cost comparison of 480 volt wiring versus 208 volt

	Added cost at 208 volts		Added cost at 480 volts
	1% Drop	2% Drop	
(1) Main service conductors	$ 130	$ 130	
(2) Main service switchboard	3,163	3,163	
(3) Space for switchboard	1,000	1,000	
(4) Feeder to cafe and elementary school	4,680	1,560	
(5) Feeder to kitchen	4,680	1,560	
(6) Feeder to industrial arts building	750	250	
(7) Feeder to classroom #1	183	52	
(8) Feeder to classroom #2	183	52	
(9) Feeder to administration building	4,680	1,560	
(10) Feeder to gymnasium	25,920	12,960	
(11) Lighting panelboards	570	570	
(12) Transformers			$ 7,856
Total added costs	$45,939	$22,857	$ 7,856

Savings, 480 volts over 208 volts: at 1% drop, $38,083—at 2% drop, $15,001

Avoid the pitfalls in specifications

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities
Electrical Wholesalers
Electrical Inspectors
Industrial Engineers
Consulting Engineers ✓

◆ PITFALLS abound in the business of electrical estimating. Certainly, one of the most frequent causes of omissions of important items in the cost estimate is failure to study specifications carefully both alone and in conjunction with the plans.

Different estimators may follow somewhat different routines but most estimators will prepare a plan and specification record and note sheet on jobs of any size. Such a sheet becomes a valuable index to the many important details of the job, and what is even more important, by the time the estimator has prepared a carefully detailed plan and specification record and note sheet, he will have developed a good over-all picture of the job which will be most advantageous as he proceeds with the other details of the estimate.

Also, if the plans are studied in conjunction with the specifications, the estimator will discover instances where items are listed in the specifications but are not shown on the plans. By noting these on the plans, he makes it possible to include such items in his first take off totals, rather than have them overlooked until the specification notes are checked.

The designing engineer, when preparing specifications for a multicontract project, must exercise particular care that each of the separate contracts covers all the items expected of the contractor who will perform it. The work must be divided carefully so that there are no voids or overlapping between contracts. For the greater part of the construction work involved, there will generally be no doubt as to which contract is to include it, but unfortunately there are many items which are inherently controversial—items that by their very nature are always on the border line between two or more trades.

These controversial items are sometimes handled by one trade and sometimes by another. Various factors enter into the decision such as type and size of job, local labor union jurisdiction, etc. If these controversial items are not spelled out in the contracts, there may be misunderstandings and law suits.

A qualified consulting engineer will generally make certain that all of the work is fully covered in the specifications, recognizing that all of the drawings (structural, architectural, plumbing, outside utilities, etc.) may constitute the drawings for each and every trade.

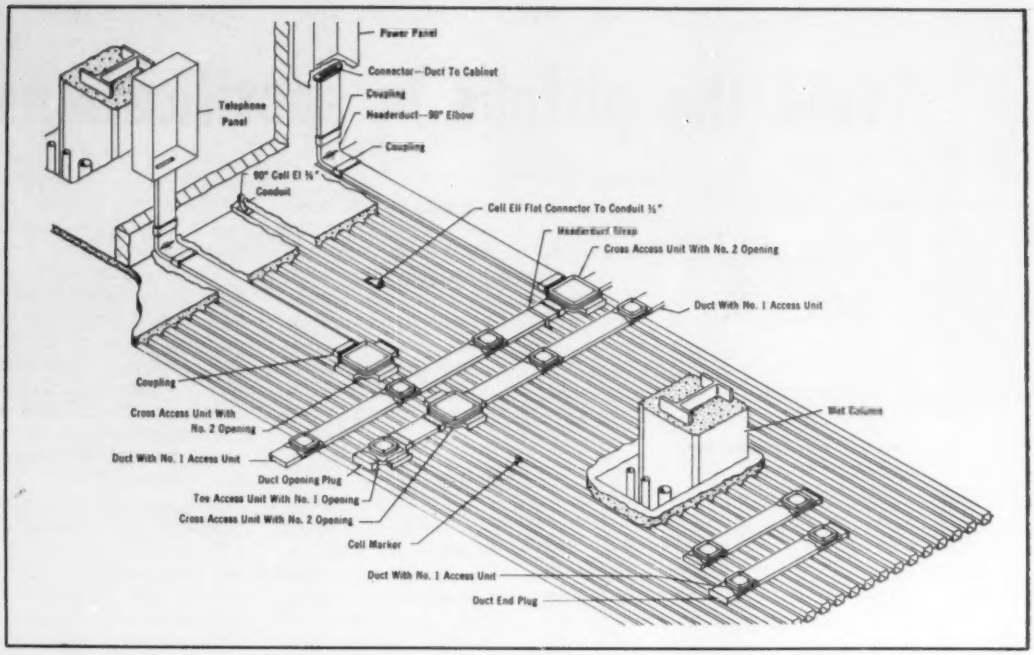
However, there are instances where important items may be shown only on drawings, and the electrical estimator who checks specifications and plans with respect to these debatable items may thus make certain that he has not missed items that are actually supposed to be a part of his contract. Or if it develops that they

(Continued on page 55)

Check list of border line items that may be included in electrical contracts*

1. Demolition of electrical wiring, conduit, and equipment
2. Excavation and backfill for electrical work
3. Concrete foundations for outside lighting standards
4. Outdoor transformer vaults-pads-enclosures
5. Manholes and handholes for electrical work
6. Cost of cutting, patching, restoring, and refinishing paving and lawn areas which have been disturbed after completion to permit construction of electrical work. Such restoration is to be done by General Contractor who shall be reimbursed by Electrical Contractor
7. Foundations and pads for electrical equipment
8. Cost of cutting holes, chases, recesses, and openings in construction materials, and cutting, patching, restoring, and refinishing of finish materials, to permit the installation of electrical materials, if proper and sufficient information for forming such holes, etc. was not given to the General Contractor prior to the commencement of the General Contractor's work. All such cutting, patching, etc. is to be done by General Contractor who shall be reimbursed by Electrical Contractor
9. Anchor bolts, hangers, inserts, sleeves, thimbles, and other devices for installing and supporting conduits and electrical equipment, including placing and maintaining such devices in proper position
10. Sleeves for conduit passing through floors, walls, partitions, and roofs
11. Flanged sleeves for conduit passing through membrane waterproofing; caulking between sleeves and conduit
12. Counterflashing of conduit passing through roofing
13. Access panels to conduit spaces
14. Feeder circuits to outside signs
15. Feeder circuits to motors, starters, and control panels for mechanical systems
16. Wiring and connections to all electrically operated equipment and all equipment requiring electric service, which is furnished and installed by other contractors
17. Providing and maintaining temporary electric service, including lamps, for construction purposes. (Electric current will be paid for by General Construction Contractor)
18. Painting and code marking of electrical raceways and equipment in "unfinished" rooms as defined or scheduled
19. Cost of standby electric service for maintaining electrical equipment during operation of the permanent heating equipment before acceptance by Owner

*Adapted from August 1959 issue of *Consulting Engineer* by special permission.


Power Panel
Connector—Duct To Cabinet
Coupling
Headerduct—90° Elbow
Coupling
Telephone Panel
90° Cell El ½" Conduit
Cell Ell Flat Connector To Conduit ½"
Cross Access Unit With No. 2 Opening
Duct With No. 1 Access Unit
Coupling
Cross Access Unit With No. 2 Opening
Duct With No. 1 Access Unit
Duct Opening Plug
Tee Access Unit With No. 1 Opening
Cross Access Unit With No. 2 Opening
Cell Marker
Duct With No. 1 Access Unit
Duct End Plug

(1) The central section of this typical installation of duct shows all of the components of a headerduct system ready for wiring. Jack headers carry wiring behind columns. (2) After locating a cross access unit, two holes are cut in the cell with a circular saw. These holes are spaced by the template lying beside the workman's knee.

(3) The two holes in the cell are the ends of an elongated opening which is completed in the cell for a cross access unit by cutting out the "dead metal" between the holes. If debris falls into the cell during this operation, it must be removed.

(4) Before installing cross access units, efficient procedure is to complete several openings into the cells. The round capped openings (right) are not parts of the duct system, but provide for welding cellular floor to supporting steel of the building. (5) To fit adjacent cross access units over finished openings in cells, a line is used to align them. A coupling with clamping screws connects the two units.

How to install headerduct

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆WIRING in modern office buildings for electric power, telephones, and intercommunication systems is being run more and more frequently through the cells of cellular floors, often used as the base for concrete floors. In addition to their structural advantages, cellular floors offer the highest degree of flexibility in the distribution of wiring systems when used in conjunction with headerduct. Wiring can be brought out within six inches of any desired location for power outlets or telephone with runs of headerduct over and across the cells in the floor.

(Photos continued on next page; text on page 48.)

This article adapted from data and photos of The National Supply Co. Pittsburgh, Pa.

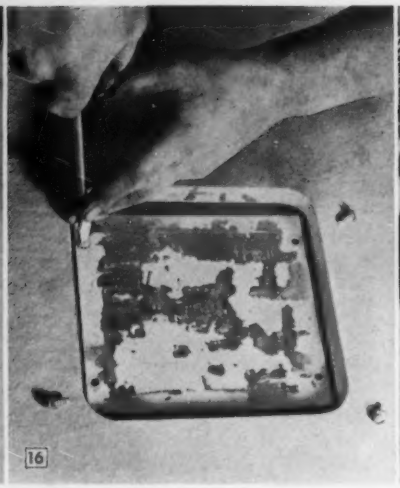
(6) Cross access units may be held in place by straps over plugged side openings. The open unit shows an oval cast iron grommet which extends down through the cell opening and protects wiring from the sharp edges of the sheet metal. Covers, held by four screws, are replaced after positioning the units.

(7) Runs of headerduct can be held in position by tact welds or by straps fastened with self-tapping screws in punched holes in the valleys between cells. The system will be waterproofed by sealing compound spread over the end of the duct before it is permanently inserted in the coupling. (8) A long level enables checking the access units between two runs after the height has been properly adjusted. A small level is also used to check the unit itself.

(9) A removable end plug in a 90-degree vertical elbow prevents dirt and cement from entering the access unit and cells until the vertical run of duct is added. This plug is one that was removed from one of the cross access unit duct openings, which is the same size as the duct. Plugs must be removed from all openings that are to be coupled with duct. (10) Duct may be run into a panel board before the concrete is poured. Paired cross access units provide flexibility in handling wires entering the panel from opposite directions.

(11) Jack headers are necessary to carry wiring behind columns, as shown by line drawings. First step is to locate it by the floor wiring plan. Pilot holes in the duct permit the installer to punch holes in the cell for self-tapping screws which are used temporarily to hold the unit in place until a grommet holds it on the duct. (12) Special connectors are used for conduit when it is connected into a cell. This conduit carries wiring from the cell to outside wall outlets. Self-tapping screws hold these connectors over a hole cut in the cell. The fitting enters the hole far enough to protect wiring from abrasion on the edges of the duct opening.

(13) After the concrete has hardened around the shields of the access units, it can be chipped out of screw heads in the adjusting frame (or ring) and the height of the cover adjusted again if necessary. Height of cross access units is being checked before the next section is covered with concrete. (14) Maximum flexibility of header-duct at minimum cost can be attained by use of capped-opening duct with access units on alternate openings, as shown here. Access units are readily added when needed. Access openings may be as close together as 12 inches, and access units may be installed originally on a smaller fraction than one-half, as specified.



(15) When duct is installed with capped openings, access units may be added as required by chipping out the concrete over the cap. The concrete is first "scored" on the four sides of the shield to prevent jagged breaks. It is then chipped out with chisel and hammer, as shown here. (16) After all concrete is removed flush with the shield, the four self-tapping screws that hold the square cover plate are removed. (17) In the center of the uncovered opening in the duct is a starting hold to guide a circular saw. An opening is cut through the bottom of the duct and into the floor cell below.

(18) Installation of a grommet to protect the wiring from the rough edges of the sawed access hole requires a special hydraulic tool which expands the lower rim of the grommet, thus holding the edges of the two holes together. (19) The grommet not only protects the wires when they are pulled, but grounds the duct electrically to the cellular floor. The square supporting frame (or ring) is held in place by the same self-tapping screws and same holes that hold the cover plate. (20) Captive adjusting screws in the four corners of the access frame are used to level the top of the unit with the floors.

Provisions for the use of these cells require laying ducts with "headers" over and across the floor cells so that wiring can be run through as many cells as there are headers in the duct. A typical system and floor plan are shown by the line drawings.

Installation of a headerduct distribution system of this type is relatively simple when using components that have been well designed for the purpose. The system is installed while the building is being erected, as soon as the cellular floor is in place, and before the concrete fill is laid over the cells. Installers follow a plan drawing of the floor, such as the one shown, which has been simplified for illustration. All cells must be sealed against moisture, just as the overlaying duct system is sealed.

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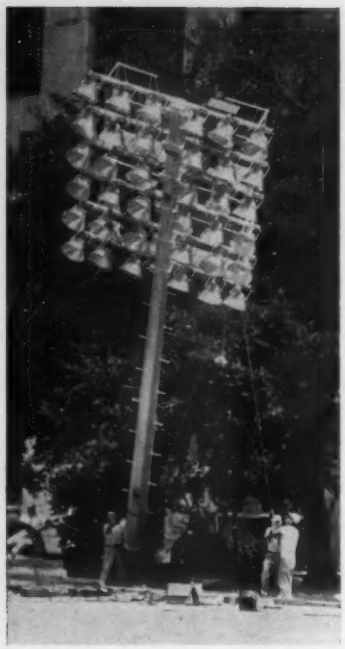


(1) A base section of the new floodlighting system at LSU in Baton Rouge is shown being guided into place on top of the Tiger Stadium. (2) After the base is in place the workmen raised the top section. (3) This photo shows the top section being raised so that it can be fitted into the lower end. (4) Workmen precariously cling high up in the air to fit the two sections of the steel pole into place.

Light for LSU stadium termed "best in nation"

By Olen J. LeBlanc

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers ✔

◆ WHEN 68,000 football fans filled the big LSU Tiger stadium at Baton Rouge, La., recently for the first night game of the 1959 season, they were awed by a completely new floodlighting system which has been termed the "best in the nation."

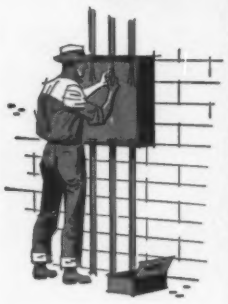
Constructed by Sachse Electric Company, of Baton Rouge, the new floodlighting system embraces the very latest innovations in this type of electrical installation. The facility was designed by W. H. Dyer & Associates, consulting engineers, Baton Rouge. Kerrigan Iron Works furnished the metal poles and Appleton Electric Company supplied the floodlamps.

The Sachse firm, long noted for its many large and unique electrical installation projects on both the North and South American continents, began the new installation during the summer months, and the job was completed upon the opening of the University's fall term.

The major obstacle confronting Sachse workmen on the job was the height versus weight factor in lifting the big electrical towers high on top of the giant football stadium on the LSU campus. The installation included eight towers and sixteen individual poles, holding a total of 572 floodlights.

The contracting firm accomplished this feat by hoisting the facilities up in two sections using powerful crane lifts. First the low-

(Continued on page 137)



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(Left) Attractive all-electric Progress Homes have found rapid acceptance by home buyers in the Dallas area. This sub-division is the first all-electric addition in the area. Post lamps with photo-electric cells and foot-path lights are included with the home. House numbers on the front porch and door chime switch are also illuminated. (Below) W. J. "Bill" Chambers, builder, and Pete Trelli, foreman, Murr Brothers, electrical contractors, look over the wiring diagram for the houses.

All-electric subdivision features low-cost heating and cooling

By Bob King

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electrical Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers ✔

◆ ONE OF THE LARGEST all-electric housing additions in the Southwest is now under construction in Dallas, Texas, back-yard of some of the largest natural gas producing areas in the country.

Progress Homes are being developed in Dallas by the S. H. Lynch Co. W. J. "Bill" Chambers, builder, reports that sales have been remarkable for the first month with 31 of the new homes sold. Several hundred are planned for the new addition.

Since there are no gas connections whatsoever in the new houses, Chambers is able to point out to prospective customers that all-electric living saves a great deal of money in heating and air-conditioning costs and in the use of all-electric appliances.

Many Dallas homes of comparable size to these three to five bedroom homes with air conditioning result in electric bills as high as $75 per month during the summer. The secret of lowering the cost of air conditioning and heating in the Progress Homes is the heavy insulation that is used. More than seven inches of insulation is used in the attic, and at least four inches is used in the walls.

The entire house is heated or cooled by thermostatic control coupled to an electric heat pump system, which the builder claims will provide automatic heating or cooling the year around for an average of $10 to $15 per month. The homes of 1850 square feet can be cooled with 2½ tons of air conditioning.

Pete Trelli, electrical contracting foreman for the firm of Murr Brothers, Dallas, electrical contractors for the job, said that the homes were built in close cooperation with the Dallas Power and Light Co., and wiring installations far exceed the city code requirements.

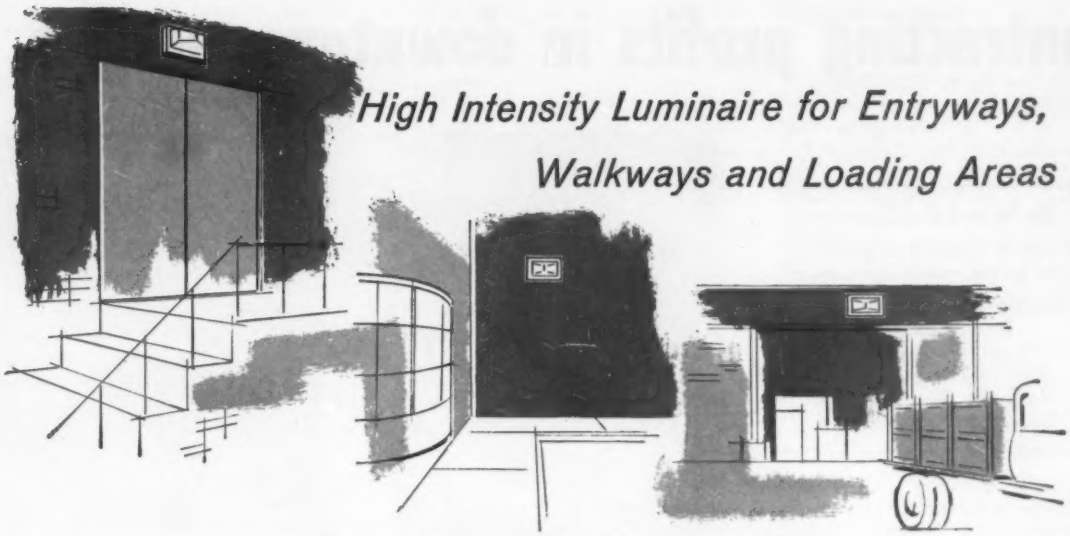
The houses have a 200 amp, 32-circuit panel which Trelli says will take care of the expected need for increased load by the addition of electrical appliances for at least the next five years.

Single-phase, 120/240 volt, 3-wire service is used throughout the houses. Current load with the electrical appliances and equipment that is included in the purchase price of the new homes is about 120 amperes.

Included in the price of the new homes, ranging from $19,950 to $23,895, is a complete intercom system with AM-FM radio, overhead electric heaters and fans in the bathrooms, lifetime, quiet type switches in all rooms, indirect fluorescent lighting in the dens, electric post lights with photo-electric cells and waterproof outlet in the front yards, footpath lights near sidewalks, three waterproof outlets at the back of the houses, and reading spots in such places as bedroom and dens.

In the kitchen is a built-in electric range with vent hood, electric

(Continued on page 136)



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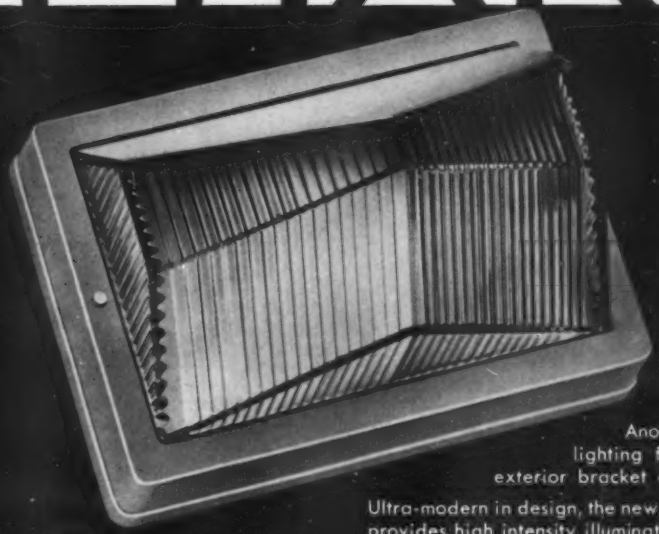

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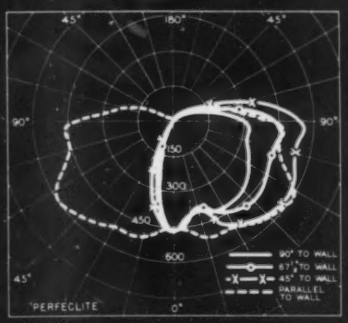

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Contracting profits in downtown service

By Wendell Givens

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ CONTRACTOR Henry Durham is electrical doctor to many shops, offices, and stores in downtown Birmingham. He maintains records of their electrical layouts, capacities, and probable future needs, and renders speedy service on their emergency calls through his close-in location.

Durham Electric Company is only a block or so from almost any point in the Birmingham retail district. As the only electrical contractor in the immediate area, Mr. Durham has built a large volume of business servicing the needs of stores ranging from small dress shops to large chain department stores.

Because of its location, Durham Electric rarely experiences transportation or parking problems in answering calls. In fact, more often than not on rush jobs, a Durham electrician can walk to a shop before a contractor out of the downtown area could get there by truck, thus providing a faster, more economical job.

Before Mr. Durham entered military service in World War Two he was employed as an electrician on commercial jobs. Realizing the potential business downtown, after the war he launched his own contracting firm on a small scale.

Early in the business he learned the value of accommodating maintenance men for downtown stores. Some of his best accounts resulted from such service.

For example: The maintenance man for a dime store came by the Durham shop looking for a small part for a fan. Mr. Durham went to a little trouble to provide it—and a short time later was called to the store for a repair job that totalled $18.50. The next year he installed $18,000 worth of lighting

A file kept by Durham Electric on each customer includes electrical layouts, load data on circuits, and estimated probable future requirements.

Every inch of space counts in downtown property and electrical equipment must often be tailored to fit exact space in downtown stores.

Wall brackets support heavy conduit in department store. Durham used this method so store would not lose use of floor space during job.

for the store. All told, in the 10 years since he supplied the fan part he has done jobs totalling almost $100,000.

On another occasion, Mr. Durham stopped by a store to explain the electrical system to a service man new on the job. The accommodation led to a $16,000 installation job.

Mr. Durham's first customers were dress shops, most with women managers and no maintenance men. They called him for service on all electrical work and even related lines such as plumbing. In the latter case it usually was a flooded basement or elevator shaft, actually an electrical job as pump failure was the cause of trouble.

Mr. Durham either remedied the trouble or advised the store managers what other craft to call. He was summoned on so many pump failures he purchased a portable pump to lend out as needed.

"Downtown businesses, especially stores, cannot of course tolerate darkness or any type electrical failure," Mr. Durham said, "so we keep our work schedule arranged so that we can get a man to a trouble spot in a hurry. Usually he can make the repair on the spot; sometimes he must tie them up for temporary service, then do the permanent job after store hours."

Good records important

Mr. Durham keeps thorough records on his customers as to voltage, motor capacities, circuits, and probable future needs. Thus, when trouble comes he usually can spot it faster and make amends in short order.

The records are especially helpful as most construction in downtown Birmingham, as in other large cities, is of ancient vintage. Physical characteristics of the old systems make it important to conform 100 per cent with the Electrical Code, and Mr. Durham works closely with city inspectors. Nelson Bryant, chief electrical inspector for the city, lauded Mr. Durham for "his careful adherence to the Code and cooperation in calling us in on any doubtful situations."

Mr. Durham also maintains close contact with the Alabama Power Company in sizing up a customer's likely future needs. The utility informs him of the maximum power used by a store or office, and he bases additions on that maximum.

Because of his knowledge of downtown buildings, Mr. Durham can bid many jobs lower than other contractors, who must allow for the unknown. He also usually knows which jobs to steer clear of altogether!

The biggest problem in figuring downtown remodeling jobs, Mr. Durham explained, is load circuit analysis. Most buildings are designed for only a fraction of the power they use, and it is a constant problem to help the tenant maintain adequate electric service. Durham Electric uses various instruments, such as clip-on ammeters, to help take the guesswork out of determining capacity loads.

Despite Mr. Durham's knowledge of downtown construction, many jobs still must be handled on a cost-plus basis.

Much of the company's success in building up and holding accounts Mr. Durham attributes to a precise billing procedure. "Everybody likes to know what he's paying for," he asserted, "so our bills show every individual item used, list labor charges, and even sales tax separately. We feel this helps our customers understand the high cost of electrical supplies, and when they get a breakdown on costs, they usually feel they are getting a good price. At least, that's what they tell us."

Such service, along with the company's analyses of future electrical needs, usually results in Durham Electric's being recommended to an incoming tenant by the previous one.

After-hours service frequently is required in the downtown work but Durham Electric discourages it, whenever possible, for two reasons: (1) The electricians are tired and less efficient after a full day's work, and (2) such work is more expensive to the customer.

Space naturally is a critical problem for a downtown contractor. The Durham Electric offices are on the ground floor in the rear of a building with a gun shop in front, giving the company excellent access to the alley. It has the entire second floor for stock.

"The space-saving secret in such a downtown operation," said Mr. Durham, "is in knowing what equipment and supplies to maintain. Knowing your customers well will take care of that."

"We pay a price for being close in," he admitted. "We have a rule of throwing away what we don't need instead of letting it remain on the shelves taking up valuable space. We maintain as small stock as possible and turn over supplies fast.

(Continued on page 136)

Specifications

(Continued from page 43)

were not included in any contract, he will be prepared to handle them as an extra.

The check list included in the accompanying table will prove helpful therefore as a means of double checking the plans and specifications particularly for these border line jobs.

Debatable items

On every job there are a number of these debatable items. Typical of those applying to the electrical trade is the matter of sleeves, so important where conduit or piping passes through membrane waterproofing. Shall the concrete man provide and install these sleeves? After all, he is sometimes the sole contractor on the job in the early stages of the project. Or shall the piping or electrical contractor provide and deliver them to the concrete contractor in sufficient time to permit installation without delaying the work? Or shall the waterproofing contractor provide suitable sleeves and flash them into the plies of his waterproofing? Moreover, after the pipes or conduit are in place who caulks between the pipes or conduits and the sleeves? Does the waterproofing contractor have the undivided responsibility for the water tightness of the entire installation or does the plumber caulk between his own pipes and sleeves and the electrical contractor between his conduit and sleeves? This discussion demonstrates the wide divergence of views as to who does what—and the basis for some red hot arguments when water starts to seep in around the pipes!

Typical problems

Typical of problems encountered on large projects is the opening or altering of construction materials and the subsequent refinishing. Most contracts will cover this possibility by an item similar to No. 8 in accompanying tabulation. The tabulation also lists a number of other border line type operations which may be made part of the electrical contract. If the estimator uses a check list of this kind on every job, he will not overlook any details that may be covered only vaguely in specifications. His alertness in this respect may enable him to avoid disagreeable arguments and even law suits.

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Arvin 400 Series-Heavy-duty, for home or office use. Push button controls, Safety Limit Thermostat and warmth-casting reflectors are buy appeals in all models.

Arvin 300 Series—In Summer the husky fan cools, in Winter it provides extra penetration of warmth. Push button controls in all five models.

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Contractors tell how

The low bid isn't everything-- the job must fit customer needs

By H. E. Meyer
Owner
City Electric Co.
Victoria, Texas

◆ WE HAVE LEARNED by experience that it is not always the low bid that offers the lowest ultimate cost to the customer; and by approaching prospective contracts on this basis, we have been able to overcome price-consciousness on the part of numerous prospects particularly those in the commercial and industrial field.

A case in point is a recent installation we made for an oil derrick manufacturer in Victoria—Sky Top Rig Co., owned by Weems Moller.

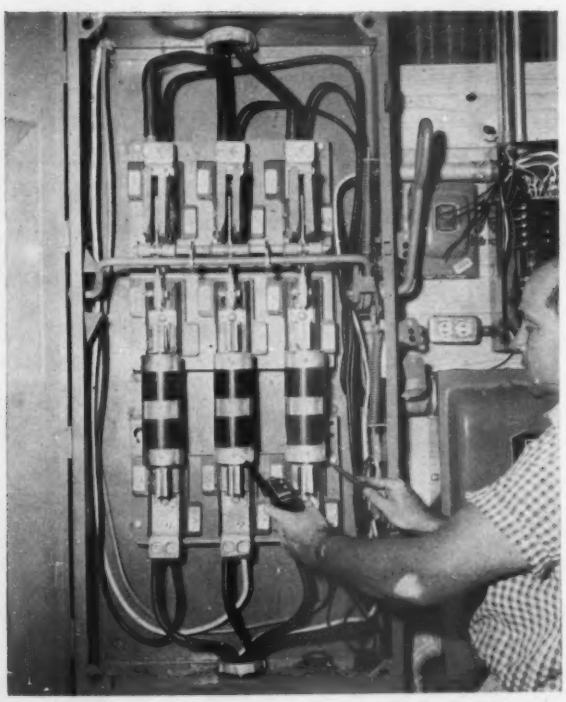
This customer was faced with a specific problem, and because we were able to talk with him before final plans for the building were complete, we were in a position to recommend a specific electrical wiring system that not only saved him considerable money at the outset but will continue to effect savings by eliminating what would have been considerable lost motion by employees if a typical installation had been made.

Although the company needed electrical power for operating various pieces of light and semi-heavy equipment, such as lathes, its biggest need was for proper and adequate power to operate a five-ton overhead crane, which was installed to move from one end of the 160-foot long metal building to the other, and back and forth across the 60-foot width.

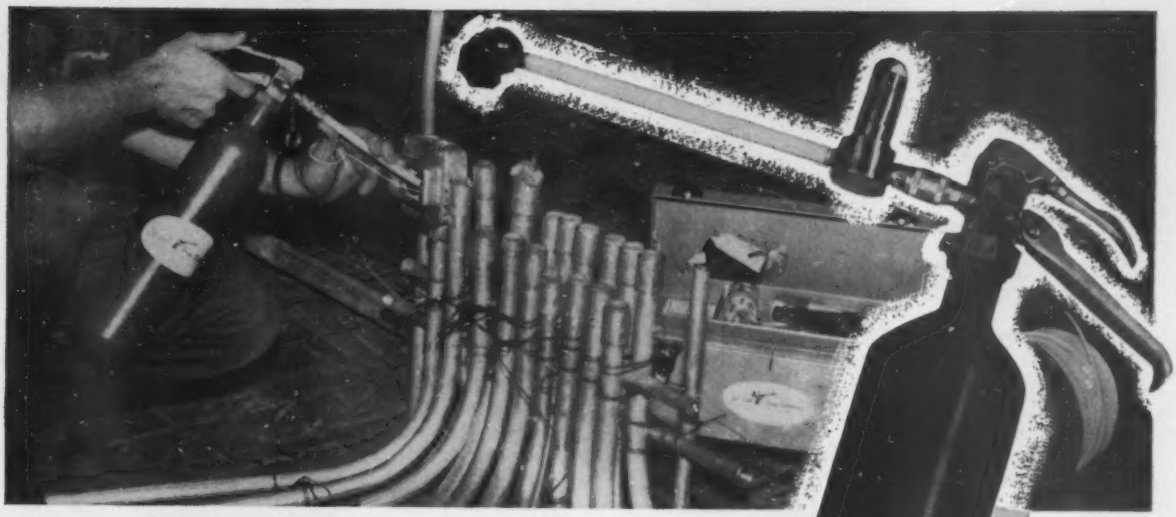
By planning ahead and working closely with the owner and his architect, we were able to install a single box from which power for the entire operation may be controlled.

The installation is 440 volts throughout. Feed-in is 500,000 MCM in 4½-inch conduit to the 600 ampere main line switch. The control box is on the wall on the west side of the building, about

Five-ton overhead crane presented power problems which H. E. Meyer solved with a 440-volt installation.



This is the panelboard through which 440-volt lines serve plant equipment including the crane.



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With the Jet Line Cylinder, you can lay a line through one . . . ten . . . even fifty conduits in a few minutes, regardless of lengths, bends, or loose obstructions! Just place a line package in the conduit and secure the free end of the line. Butt the Jet Line Cylinder seal-off assembly to the end of the conduit and activate the valve . . . tremendous pressure, unleashed by the expansion of a harmless gas, travels the lightweight line package through the entire length of the conduit in a split second! The strong nylon line, laid down by the speeding package, is used to draw polyethylene rope . . . then wire . . . through the conduit in minutes!

Completely safe, the Jet Line Cylinder uses no inflammable substances or explosives of any kind. Both the nylon line and polyethylene rope are non-conductors, so there's no danger in working hot panels.

The Jet Line Cylinder Kit can pay for itself on one or two jobs! Kit contains: cylinder with valve, pressure regulator, valve operating mechanism, and full pressure attachment with variable head. Cylinder can be refilled; spare cylinders available. Order your Jet Line Cylinder Kit today . . . forget fish tape forever!

★OPERATES UNDER ALL CONDITIONS

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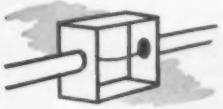
★USE IN ANY LENGTH ½" or ¾" CONDUIT

Sweeps through multiple bends, offsets . . . eliminates snaking in any length conduit. Jet Line Cylinder is economical to buy and use. Easy to handle . . . weighs only 9 lbs.

★CAN JUMP BOXES



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4130

one-third the distance from the front.

The installation consists of the main line switch, a light control switch, and a distribution panel, all adjacent to each other. For lights, we used a 25-kw transformer to reduce the 440-volt service to lighting branch circuit voltage.

We installed floor duct under the concrete floor before it was poured, to reach the various outlets needed for operation of the machinery and equipment.

It has been our experience that when we are able to induce the prospect to sit down with us and allow us to work out the best electrical wiring and installations for him, with economy in the future in mind, the matter of the contract price becomes secondary.

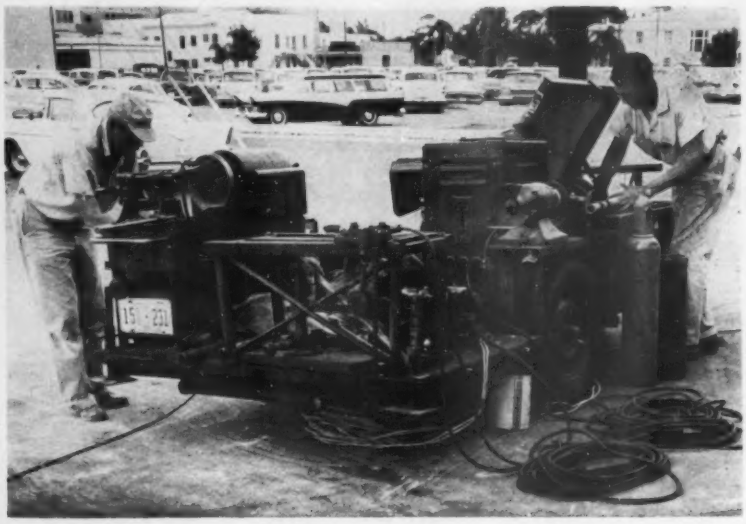
Mobile rig, excellent investment in time, labor, and cost savings

By Don Parker
Gulf Electrical Refrigeration
Bradenton, Fla.

◆ A "RUBE GOLDBERG" assembly mounted on a low-boy trailer that hitches on to a service truck provides a most useful mobile rig for our company. It has a variety of uses on the job and saves us superfluous trips back to the shop.

The unit has a power hacksaw and portable grinder and is useful in electric and acetylene welding operations. It is equipped for power threading, and the steel table is used in the fabrication of many units right at the job site.

A vise and pipe bender, plus the other equipment, enable two or three men to work at the rig independently of each other at the same time. The vast variety of operations that may be performed with its aid and the time, labor, and cost saving features of the rig make its cost well justified.



Mobile tool rig used by Gulf Electrical Refrigeration.

Discount system for easily solving collection problems

By Ross Cutting
Ross Electric Service
Orlando, Fla.

◆ LIVES THERE an electrical contractor who never wondered, as he started a rough-in, if he was going to have difficulty collecting when the trim-out was completed? Probably there is not, but I have a policy that makes me reasonably certain that my "difficult" collections will not only be very easy but also free of expense. I write a little "safety device" right into the bid. This skeleton bid will show you how it works: (The figures are purely imaginary.)

Your office work-sheet might show these figures:

53 outlets at $3.50	$185.50
1 range top circuit	10.00
1 oven circuit	10.00
1 furnace circuit	7.00
1 water heater circuit	11.00
100 ampere service	140.00
Total	$363.50

You actually want to receive $363.50 for this particular job. (Fixtures have been omitted to simplify the example.) It is possible to have collecting done for 20 per cent, sometimes 15 per cent, so you take 20 per cent of $363.50 which is roughly $73.00 and add it to the above figures. Add the $73.-00 all in the first line if you itemize your bids, or if you make a one-figure bid, not itemized, just show your bid this way:

53 outlets, 1 range circuit, 1 oven circuit, 1 furnace circuit, 1 water heater circuit, 100 ampere service—

Bid	$436.50
Cash discount	73.00
	$363.50

Cash terms: 70 per cent payable on completion of the rough-in; 30 per cent payable on completion of the trim-out.

Customer's signature
Contractor's signature

Probably 98 out of 100 of your customers pay you as they agree to pay. This safety device "pops" for the other two when you turn the other two accounts over to an attorney, before the lien period has expired. After the trim-out has been completed and you cannot collect the balance due then the cash discount does not apply any longer. You can claim your entire bid, which includes collection fees,

(Continued on page 136)

NEW branch circuit WIRE CONNECTOR

IDEAL WING-NUT®

*the **only** one-piece screw-on connector that gives you **all** these benefits . . .*

THE ONLY BUILT-IN WRENCH

Unique wing grip. Twist WING-NUT on quickly, easily, by hand without *any tools*. Easy to splice even largest stiff wires. Simply screw on, then snip off wings for compact spaces. No awkward, slippery, soft-plastic grip. The easiest branch circuit connector you can use!

THE ONLY VISIBLE SPLICE

Your splice is always visible—no take-apart for inspection. WING-NUT is the only screw-on connector that lets you *see* the splice is *right* . . . through the semi-transparent Nylon insulating shell.

JOINS HEAVIEST CIRCUITS

Only WING-NUT has a Nylon shell with such a wide deep skirt to splice even the largest wires. Easily slips over two No. 8 and a No. 6. Easiest connector for thick Type RW, too. No flash-over. Two sizes to handle all your needs.

CAN'T COLD-FLOW WITH NYLON SHELL

Unbreakable, high-dielectric Nylon shell is tough and stable . . . won't cold-flow and short-out by stretching thin under pressure or strain.
WING-NUT is the *only* screw-on branch circuit connector giving you the many benefits of the strongest and safest shell . . . genuine Nylon.

THE MOST U.L. BRANCH CIRCUIT COMBINATIONS

Both sizes of WING-NUT are Underwriters' Laboratories approved as pressure cable connectors for general use (600V) in branch circuit and fixture wiring. Only WING-NUTS are approved for *474* combinations of solid and/or stranded wire.

WING-NUT is the easiest, fastest, safest branch circuit wire connector you can use. It's inner tension-spring coil actually threads and crushes wires in a shake-proof "PYTHON GRIP!" You just can't make a better splice . . . especially on the new large, hard wires.

IDEAL

The helping hand on every wiring job.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

IN CANADA: IRVING SMITH, LTD., MONTREAL

TRY IT YOURSELF • FILL IN AND MAIL THIS COUPON TODAY

IDEAL INDUSTRIES, Inc.
1017-K Park Ave., Sycamore, Illinois

Send me a free WING-NUT sample.

Name_____

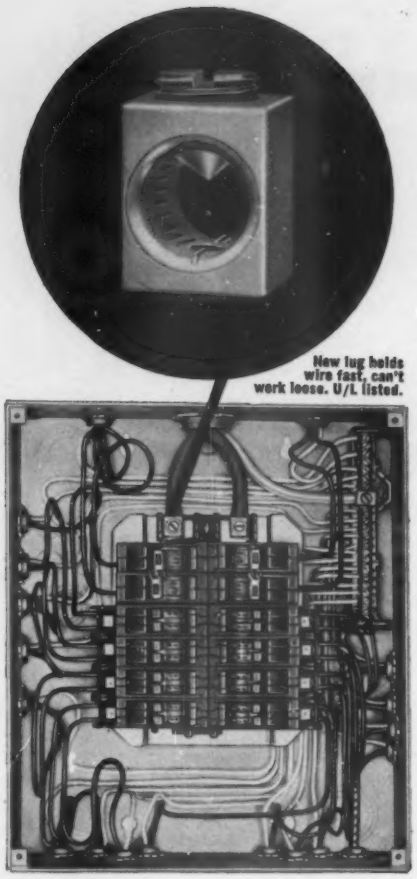
Company_____ FREE SAMPLE

Address_____

City_____ Zone____ State_____

U/L LISTED

NEW! LUGS FOR BOTH COPPER AND ALUMINUM WIRE

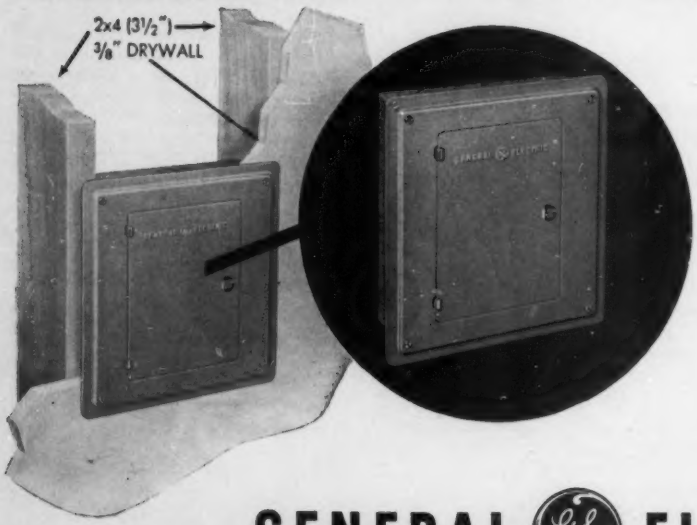


All General Electric load centers (100† and 200 amp.) and fuse pullers (100 amp.) are now U/L listed for both copper and aluminum wire—thanks to the new lug shown above which is standard on these devices *at no extra cost.*

Add this feature to the many advantages of G.E.'s new "twin" breakers and you'll see why more and more contractors are switching to General Electric for highest quality at the lowest cost. The "twin"* lets you put two quality breakers in the space you usually take for one, use a smaller load center, and realize big savings on every job.

† Except TRM Series *Trade-Mark

New G-E flush-front load centers fit flush even with 3/8" drywall



Here is a complete new line of flush-mounted General Electric "twin" load centers to answer your demands for equipment which fits flush with 2" x 4" studs and ⅜" drywall construction.

Ask your G-E distributor to show you the new *flush-front* load centers. Like all General Electric load centers, they feature Snap-Out interiors and provide automatic front alignment—even if the box is installed slightly off plumb.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

PARANITE THW and RHW

Two types available for 75°C wet or dry specified applications

NEW! PARASYN® TYPE

THW

THERMOPLASTIC INSULATED
600 V BUILDING WIRE

New UL listed 75°C building wire for wet or dry applications. Specially formulated Paranite vinyl insulation. Small diameters, slick silicone finish, color availability and stripping ease all contribute to reducing handling costs!

MYLAR TAPED®
PARATEMP® TYPE

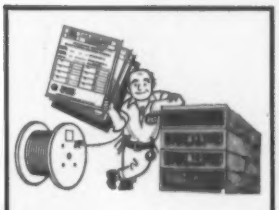
RHW

600 V BUILDING WIRE

Taped with ® Dupont "Mylar" (AWG 6 and larger) to provide an improved moisture barrier with higher dielectric strength. Resulting diameter reductions, better fit conduit. Saturated and impregnated, braided sheath, lubricated with special waxes to reduce pulling resistance.

Both UL listed 75°C wet or dry location

Here are two improved building wire products—both offering you outstanding performance in similar installations. Standard colors available from stock in both solid and stranded, sizes 14 AWG through 500 MCM for the THW . . . and 14 AWG through 1000 MCM for the RHW. Get acquainted with advantages of both wires—write today for complete technical information!



Each Carton packaged to reduce handling and labor cost with "color-coded" labels plainly showing type, size and color of wire. Also, new reel cards for instant identification and inventory control.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Marion, Indiana

Sold only through recognized electrical distributors

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.

Sales Offices and Redistribution Warehouses in all Principal Cities

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

BOXES AND MISCL. OUTLETS
"MOUNTED ON MASONRY"
NEW WORK EXPOSED.

ITEM	HOURS EACH	LABOR COST EACH AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
					SWITCH BOXES							
Handy	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
4" Sq.	.57	1.14	1.28	1.43	1.57	1.71	1.85	2.00	2.14	2.28	2.42	2.57
		GANG Sw. BOXES (REGULAR DEPTH) AND COVERS										
2 Gang	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
3 "	.57	1.14	1.28	1.43	1.57	1.71	1.85	2.00	2.14	2.28	2.42	2.57
4 "	.68	1.36	1.53	1.70	1.87	2.04	2.21	2.39	2.55	2.72	2.89	3.06
5 "	.78	1.56	1.76	1.95	2.15	2.34	2.54	2.73	2.93	3.12	3.32	3.51
6 "	.88	1.76	1.98	2.20	2.42	2.64	2.86	3.08	3.30	3.52	3.74	3.96
7 "	1.09	2.18	2.45	2.73	3.00	3.27	3.54	3.82	4.09	4.36	4.63	4.91
8 "	1.25	2.50	2.81	3.13	3.44	3.75	4.06	4.33	4.69	5.00	5.31	5.63
9 "	1.46	2.92	3.29	3.65	4.02	4.38	4.75	5.11	5.48	5.84	6.21	6.57
		BOX COVERS AND TRIM										
Blank	.10	.20	.225	.25	.275	.30	.325	.35	.375	.40	.425	.45
Open	.10	.20	.225	.25	.275	.30	.325	.35	.375	.40	.425	.45
C.D.DROP	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
SGL.FLSH	.16	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72
DPL.FLSH	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
		TRIM (INSTALLING DEVICE AND COVER ONLY)										
S.P.Sw.	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
3.W.Sw.	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
4.W.Sw.	.52	1.04	1.17	1.30	1.43	1.56	1.69	1.82	1.95	2.08	2.21	2.34
Du Pl-Rec.	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95

E-102-B

LABOR: INCLUDES INSTALLING AND MAKE UP COMPLETE OR AS INDICATED.

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First . . . and still the best!

13 years of continuous improvement has kept "SCOTCH" No. 33 the "number one" plastic electrical tape.

"SCOTCH" AND THE PLAID DESIGN ARE REGISTERED TRADEMARKS OF 3M CO.

MINNESOTA MINING AND MANUFACTURING COMPANY
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

PORCELAIN SWITCH & OUTLET BOXES
WOOD MOUNTED

ITEM	HOURS EACH	PRICES INSTALLED EACH AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
3½ SH CLG	.32	.64	.72	.80	.88	.96	1.04	1.12	1.20	1.28	1.36	1.44
3½ OCTG	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
4" RD	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
READY	.37	.74	.83	.93	1.02	1.11	1.20	1.30	1.39	1.48	1.57	1.67
SW SHLW	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
SW DEEP	.48	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80	1.92	2.04	2.16
BLK COVER	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
DROP CORD	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
PL RING	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
				DEVICES - TRIM								
S.P.SW	.27	.54	.61	.68	.74	.81	.88	.95	1.01	1.08	1.15	1.22
3W SW	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
4W SW	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
DPL REC	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
				MASONRY MOUNTED								
3½ SH CLG	.48	.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80	1.92	2.04	2.16
3½ OCTG	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
4" R	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
READY	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
SW SHLW	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
SW DEEP	.58	1.16	1.31	1.45	1.60	1.74	1.89	2.03	2.18	2.32	2.47	2.61
BLK COVER	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
DRP CORD	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95
PL RING	.11	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495
SP.SW	.27	.54	.61	.68	.74	.81	.88	.95	1.01	1.08	1.15	1.22
3W SW	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
4W SW	.53	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99	2.12	2.25	2.39
DPL REC	.21	.42	.473	.53	.58	.63	.68	.74	.79	.84	.89	.95

11-59

STEEL BOXES - "4" Square"
RECESSED SETTING IN CONCRETE
CONDUIT CONNECTED

SIZE # OUTLETS			HOURS	LABOR COST INSTALLED PER @ FOLLOWING RATES										
Dpth	Side	Bttm	PER EA.	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
2 1/8	2½	5½	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
2 1/8	2 3/4	3, 2#	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
2 1/8	2,1	3, 2#	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
3 1/2	2 1/2	5½	.55	1.10	1.24	1.38	1.51	1.65	1.79	1.93	2.06	2.20	2.34	2.48
3 1/2	2 3/4	5 3/4	.6	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70
						4 11/16" SQUARE								
3 1/2	2½	5½	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
3 1/2	2 3/4	5 3/4	.55	1.10	1.24	1.38	1.51	1.65	1.79	1.93	2.06	2.20	2.34	2.48
3 1/2	2,1	3,2#	.6	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70

C-102-B

COMBINATION OF 3,½" and 2,3/4" OUTLETS

LABOR INCLUDES; SETTING AND SECURING BOX (NAILING TO FORM) AND MAKING TAPS.

11-59

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Sports lighting requires a combination of short-range and long-range floodlights to provide good visibility for participants and spectators, and to add dramatic effect. Economical Revere Eliptor floodlights on Revere hinged poles illuminate this race track. Revere "2000" Series long-range, rear-serviced floodlights are mounted on the grandstand roof to increase intensity of illumination at the finish line.

Solve any outdoor lighting problem with Revere's complete, matched line

Peak lighting efficiency for any outdoor lighting application calls for a number of components, each designed to do a specific part of the job. Solving outdoor lighting problems is much easier when you install Revere equipment because—

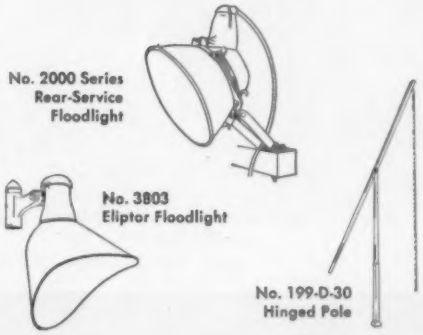
1. Revere offers the widest line, making it easy for you to select the exact combination of components to solve *any* outdoor lighting problem. Everything you need from one reliable source simplifies ordering, assures on-schedule delivery of all components.

2. Revere offers matched components . . . *structurally* matched for strength, balance, and perfect fit; *design* matched for peak lighting efficiency and best appearance.

3. Revere offers easier installation—lights, poles and accessories are made for each other. Installation is fast, easy, trouble-free.

Write for Revere's catalog of outdoor lighting equipment. You can solve any outdoor lighting problem with this complete, matched line.

Revere components used to light race track



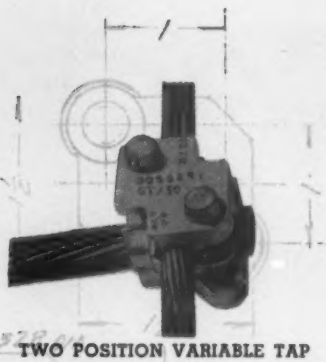
Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago-48, Illinois (In suburban Niles)
Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles
In Canada: Curtis Lighting, Ltd., Leaside, Toronto, Ontario

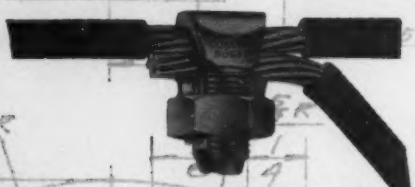
DOSSERT DESIGNED

with YOU in mind!



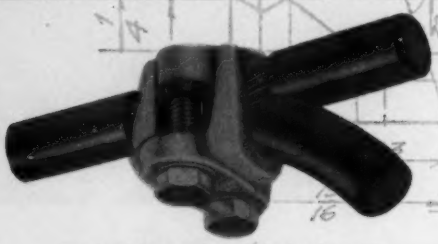
TWO POSITION VARIABLE TAP
(Type GTX)
For cross, parallel and tee tap connections.

LIGHT DUTY VARIABLE LUG
(Type G)
For economical, all-purpose cable connections.



SPLIT BOLT CONNECTOR
(Type DS)
For taps, dead-ends, entrances, motor leads, junction boxes, etc.

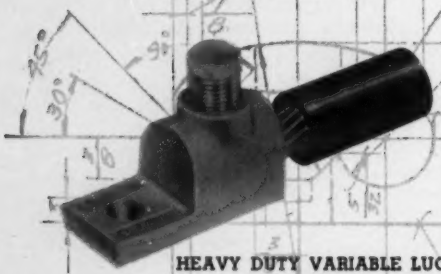
VARIABLE TERMINAL
(Type D)
Connects a wide range of copper conductors to flat bar.



TWO BOLT SERVICE CONNECTOR
(Type DSU)
For all service cable connections.
Best for larger sizes.

For YOU, the contractor...
For YOU, the wholesaler...

The products shown here are in constant demand by contractors and are fast moving stock items. All items accept a wide range of cables, thereby, minimizing the number of stock sizes. They are packaged in convenient quantities for ease of handling and are attractively labeled for quick identification.



HEAVY DUTY VARIABLE LUG
(Type HL)
Takes various conductor sizes.
Quickly installed.

Ask for pocket catalog, giving name of your distributor.

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.
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UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance

Comparator method of meter testing extended to polyphase group—see page 76

How to get maximum results from capacitors—page 72
How regulators can increase revenue—page 79
Protection for tap load stations—page 80
Smaller conductors gather thicker ice—page 90
New electric utility equipment—page 94

POWER-INSTALLED SCREW ANCHORS

average 5 to 8 man-minutes for complete installation

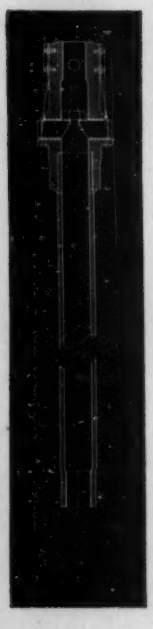
Latest advance in anchoring technique speeds line construction . . . realizes greater value from investment in hole-boring equipment

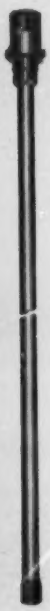
If your company uses power hole-digging equipment for line construction, you can now use that equipment to install the new line of Chance Screw Anchors.

Chance Power-Installed Screw Anchors, ranging from 78 to 176 square inches in area, can be speedily installed in all types of soil, except extremely rocky soil. Your present power boring equipment, regardless of type, can be easily adapted to power anchor installation. Only one new part is needed—the wrench shown below. This wrench transmits torque from the power equipment directly to the specially designed hub on the anchor helix. Since the anchor rod is not subjected to torque, it only has to be heavy enough to support the guy load—a cost-saving factor.

Installation procedure is extremely simple. *Step one* is to remove the Thimbleye or Twineye nut and slide wrench on the anchor. *Step two* is to fasten the wrench to the "Kelly Bar" of the power-digger, or, to fasten the wrench on the pilot bit of the auger using an adapter. *Step three* is to drive the anchor with the power equipment. *Step four* is to release the wrench from the anchor and retrieve it from the ground. (The spring-loaded "dogs" that lock rod in position are easy to release.) *Step five* is simply replacing the Thimbleye on the end of the rod—your anchor is ready for hooking up the guy wire.

These five steps are accomplished in a matter of minutes. Repeated time tests in various types of soil prove that Power-Installed Screw Anchors averaged only 5 to 8 man-minutes for a complete installation *—from the time the equipment was moved into position until the anchor was ready for the guy!*





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SHARP CUTTING HELIX of high strength structural steel is tapered to minimize earth disturbance. Special hub fits lower part of wrench.

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How to get maximum benefits from

Table 1—Comparison of capacitor application methods

Basis of capacitor application *	Reduction in reactive current energy loss per cent **	Reduction in reactive current peak loss per cent
Maximum reduction in energy loss	14.2	56.8
Maximum reduction in peak kw loss	4.3	60.2

* Capacitor rating = 0.267 per unit of maximum input kvar; reactive load factor = 0.4

** Values of energy loss reduction are in per cent of what the energy loss would be if the peak loss existed over the entire load cycle.

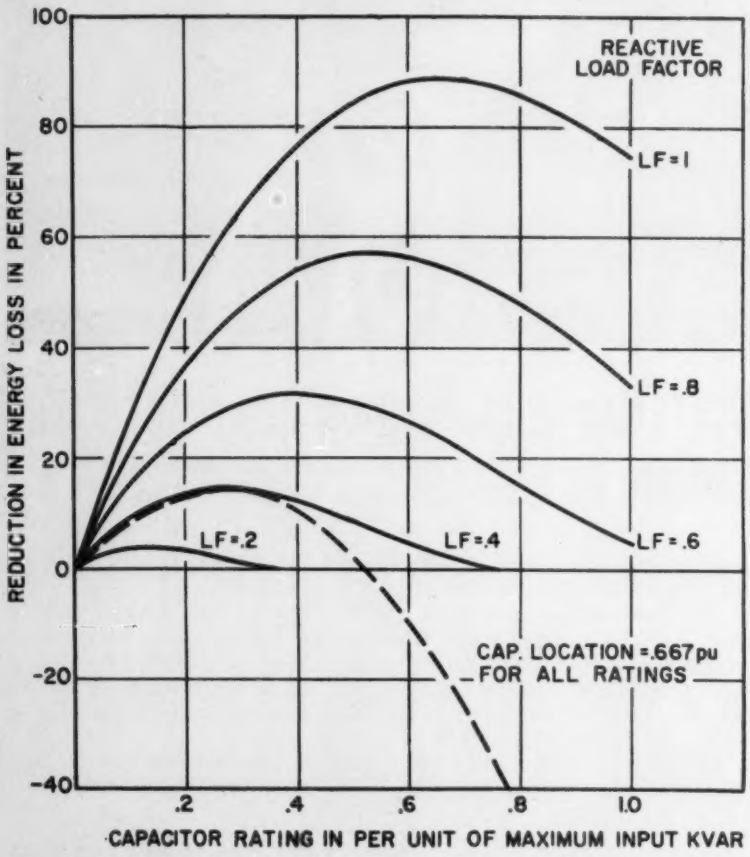


Fig. 1—Reduction in reactive current energy loss by the addition of a fixed shunt capacitor at its optimum location. Energy loss reduction is in per cent of load cycle period multiplied by maximum power loss caused by reactive current with no capacitor.

By R. F. Cook

Distribution Engineer
Westinghouse Electric Corp.
East Pittsburgh, Pa.

◆ MANY RULES OF THUMB exist for the application of shunt capacitors on distribution circuits for improving voltage regulation, reducing energy loss, and releasing system capacity. While these simple rules usually yield good results in most cases, especially when combined with good engineering judgment, the use of some of these rules can result in higher rather than lower costs.

For example, an improperly located fixed capacitor bank can actually increase the energy loss in a radial circuit with distributed load, such as a distribution feeder. The results may be even more unfavorable in such cases where excessive voltage problems were not involved.

The purpose of this paper is to review some of these rules of thumb and point out the areas requiring careful consideration.

A common rule of thumb states that for maximum loss reduction in a primary feeder circuit, a fixed capacitor bank should be rated at two-thirds the reactive load on the feeder and should be located at a point two-thirds the length of the feeder from the station bus.

The dotted curve of Figure 1 illustrates the effect of this rule of thumb on a primary feeder with a reactive load factor of 0.4. Reactive load factor is defined as the average reactive load divided by the maximum reactive load. If a fixed capacitor bank were applied to a feeder with this reactive load factor, with one using the above rule of thumb, the energy loss caused by reactive current in the line would be increased by 18 per cent.

Energy loss important

If the maximum possible reduction in energy loss is to be achieved with fixed capacitors, the capacitor locations must be based on average reactive load and not

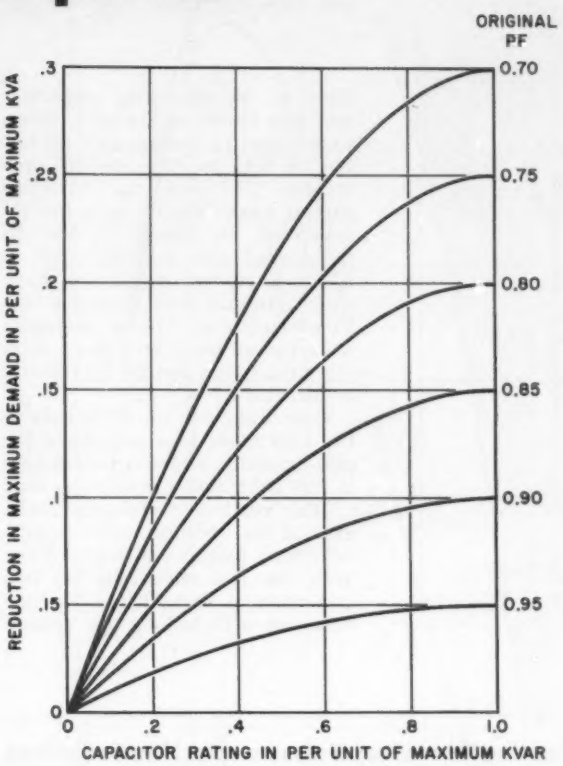


Fig. 2—Reduction in maximum kva demand versus capacitor rating.

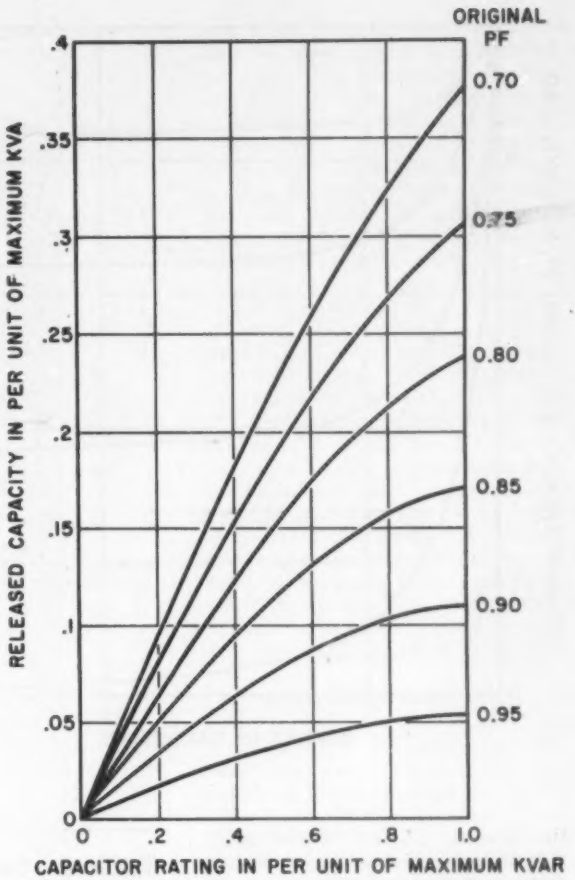


Fig. 3—Released thermal capacity by adding fixed shunt capacitors.

on peak reactive load as is the common practice. Naturally if fixed capacitors are located to give the maximum reduction in energy loss, some sacrifice must be made in the peak loss reduction. However, if fixed capacitors are located to give maximum peak loss reduction, a substantial sacrifice will be made in the energy loss reduction.

Referring to Table 1, which illustrates the effects of the two methods of application, one finds the reduction in peak loss is essentially the same regardless of the method of application. However, the reduction in reactive current energy loss is increased by more than 300 per cent, for this example, when capacitors are located to give maximum reduction in energy loss instead of maximum reduction in peak loss.

In determining the loss reduction benefits of capacitors, only the loss due to reactive line current need be considered because this is the only portion of the loss that the capacitors can reduce.

The reduction in energy loss for one fixed capacitor bank may be determined from Figure 1. These curves are applicable for any shape of reactive load cycle. Note that the loss reduction values are in per cent of what the energy loss would be if the peak load condition existed over the entire load cycle.

Kva demand reduction

Energy loss reduction is not the only factor that must be considered in determining the economical rating of fixed capacitors to be used where voltage drop is not a problem. The released thermal capacity or reduction in kva demand must also be taken into account.

In general the following two methods can be used in determining the optimum rating of fixed capacitors:

1. Capacitor rating based on balance between energy loss reduction, reduced kva demand, and capacitor installed costs. (This method is applicable where power is purchased on a bulk-rate basis)

2. Capacitor rating based on balance between energy loss reduction, released thermal capacity, and capacitor installed cost.

In either method, the capacitor location is based on maximum reduction in energy loss.

Figures 2 and 3 provide a means of evaluating the released thermal capacity or the reduction in maximum kva demand for various capacitor ratings. The thermal capacity released by adding capacitors is determined by the load that can be added at the original power factor so that the kva magnitude remains constant.

The value of the demand reduction given in Figure 2 is the result of capacitors directly subtracting from the reactive kva. There is an additional benefit of a reduction in

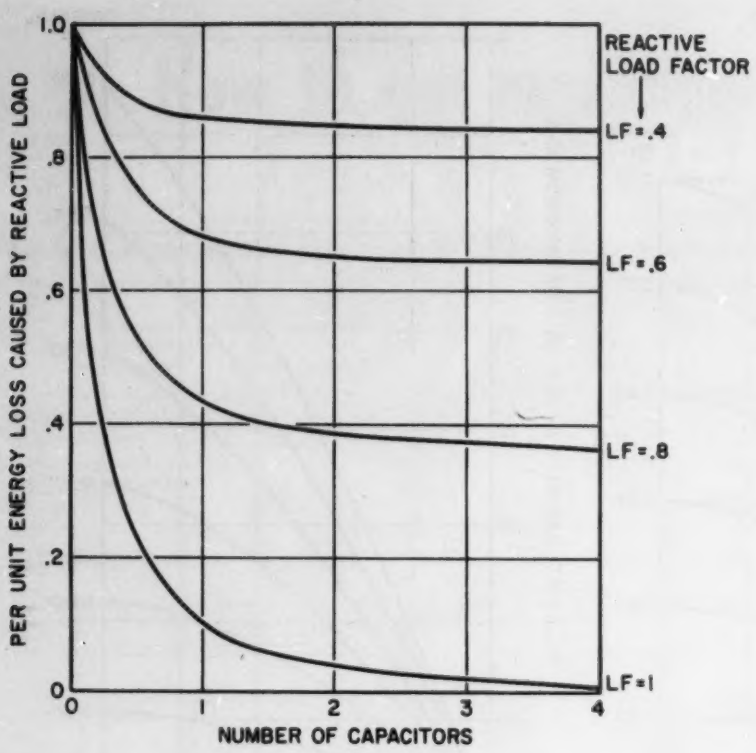


Fig. 4—Energy loss caused by reactive current versus number of fixed shunt capacitors with all designs based on energy loss reduction only.

the demand portion of the peak power loss which may be calculated using an equation given in Reference 1. Generally this refinement is not necessary.

Number of capacitors

When capacitors are applied for loss reduction only, one capacitor bank per radial circuit is sufficient. Figure 4 shows that regardless of the reactive load factor, about 90 per cent of the maximum possible reduction in energy loss that can be achieved with capacitors can be obtained with one capacitor bank. This is true, however, only when capacitor application is based strictly on maximum reduction in energy loss.

Factors other than loss reduction, such as released thermal capacity, tend to make the optimum capacitor rating higher than the rating necessary for maximum reduction in energy loss. If this is the case, more than one fixed capacitor location on a single circuit may be desirable. Where more than one fixed capacitor bank is used per circuit, it is demonstrated in the appendix of the reference that all banks should have the same rating.

The loss reduction versus total capacitor rating for several numbers of equally-rated capacitor banks is shown in Figure 5. These curves are for a reactive load factor of 0.4. In the shaded area marked "CL1 = 0," one of the capacitor banks has its optimum location at the source or bus. In the shaded area marked "CL2 = 0," two of the capacitors have their optimum locations at the bus. This means that if these capacitors were placed anywhere else out on the circuit, the energy loss would be increased.

From Figure 5, the difference in the maximum loss reductions for one capacitor and four capacitors is less than two per cent as read on the vertical coordinate. However, if the optimum total capacitor rating turned out to be 0.6 per unit, the loss reduction for two capacitors is three times the loss reduction afforded by one capaci-

Table 2—Determination of optimum capacitor locations

Load kva starting from source	Load kvar kva sin ($\cos^{-1}$pf) pf = 0.8	Line kvar profile (maximum)	Line kvar profile (average)	Capacitor locations
600	360	1200	480	337.5
200	120	840	336	
400	240	720	288	
200	120	480	192	
400	240	360	144	112.5
200	120	120	48	
		0	0	

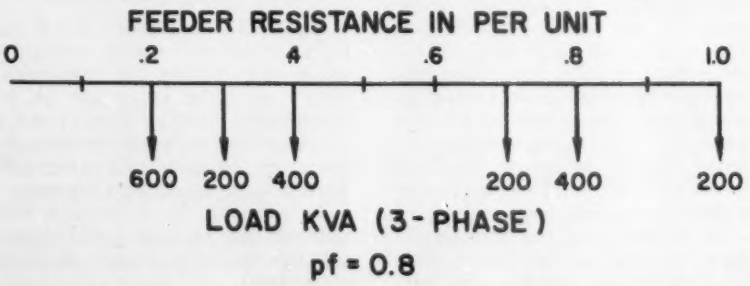


Fig. 6—Load distribution for primary feeder example of Table 2.

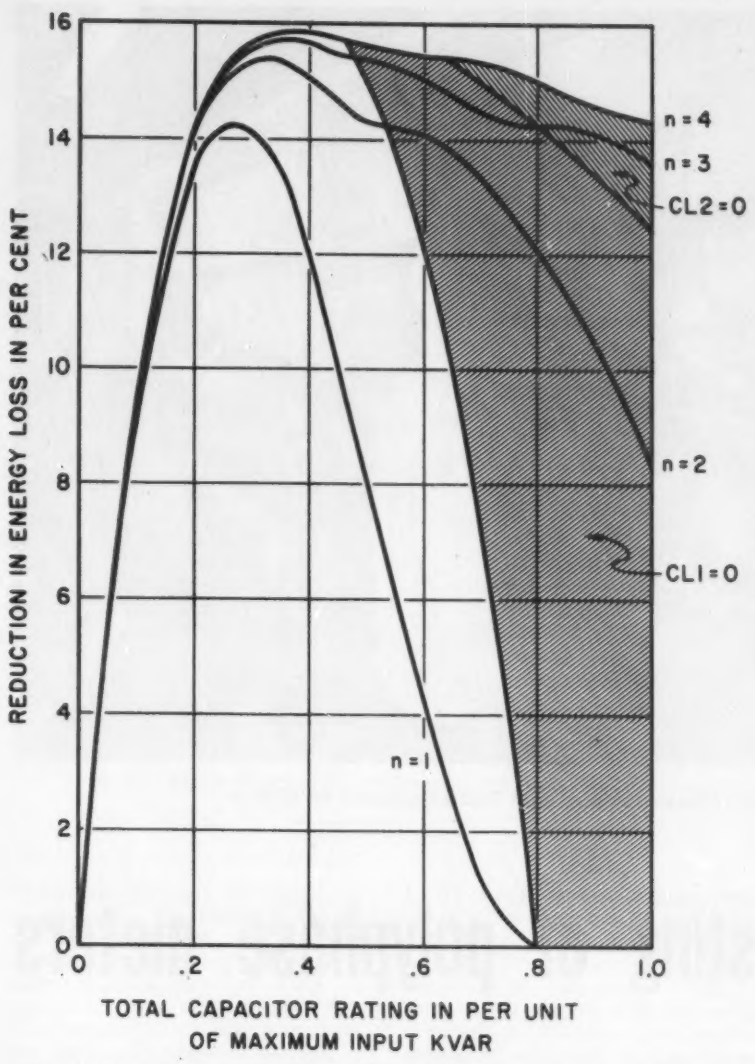


Fig. 5—Reduction in reactive current energy loss by the addition of "n" equally rated fixed shunt capacitors, each capacitor at its optimum location. Reactive load factor is 0.4. Energy loss reduction is in per cent of load cycle period multiplied by maximum power loss caused by reactive current with no capacitor.

tor. Thus, in this case, at least two capacitor banks should be used.

In general, the possible added benefits of multiple capacitor locations should not be overlooked.

Capacitor location

The previous information can be used to determine an economical rating and number of fixed capacitors. The only item that remains is to properly locate the fixed capacitors to give the maximum possible reduction in energy loss.

The following method is a very simple way to locate any number of fixed capacitors of any ratings on a radial circuit to give the maximum possible reduction in energy loss. For the sake of simplicity, assume a radial circuit with six loads as shown in Figure 6 and a reactive load factor of 0.4 (Note that this method does not rely on a uniform loading.) Assume that the optimum capacitor ratings are two 225-kvar capacitor banks.

Referring to Table 2, the loads are listed in tabular form starting from the source. In the second column, the reactive portion of these loads are calculated. Then in the third column, the maximum reactive line profile is calculated by starting at the end of the line and adding in the reactive loads in succession. The average reactive line profile is obtained by multiplying the maximum values by the reactive load factor. The capacitors are then located by determining where the following values fall in the average profile column:

$L_1 = C_1/2$

$L_2 = C_1 + C_2/2$

$L_n = C_1 + C_2 + \ldots + C_{n-1} + C_n/2$

where C_1, C_2, etc., are the various capacitor ratings. For this case L_1 is 112.5 and L_2 is 337.5. The value of L_1 is between 48 and 144 in the average profile column so one capacitor is located at the same point as the second 400-kva load. The value of L_2 is between 336 and 480 so the second capacitor is located at the same point as the 600-kva load. Even though the capacitor banks in this example are the same rating, the locating method is correct for unequal ratings as well.

Application check list

The general procedure for determining the optimum fixed capacitor application when excessive voltage drop is not a problem is as follows:

1. Assume various capacitor ratings in per unit of maximum line input kvar.
2. Using either Fig. 2 or Fig. 3 find the per unit released thermal capacity or reduction in maximum kva demand and convert to capitalized dollars for each capacitor rating assumed in Step 1.
3. Assuming that only one capacitor will be used, find the per unit energy loss reduction from Fig. 1 for each capacitor rating and convert to capitalized dollars.
4. Determine the installed cost for each capacitor rating.
5. Add the various dollar benefits and subtract the installed capacitor cost for each capacitor rating and plot a curve of net savings versus capacitor rating. The optimum capacitor rating is then the value that results in the greatest savings.
6. Evaluate the use of more than one capacitor by using Fig. 5 or an equivalent set of curves for a different reactive load factor calculated from Reference 1.
7. Adjust the optimum capacitor rating as determined from Steps 5 and 6 to conform with maximum allowable light load power factor limitations.

(Continued on page 136)

Fig. 1 — Comparator operator makes light load adjustment on meters.

Comparator testing of polyphase meters

By William O. Risley
Test Equipment Engineer
Sangamo Electric Co.
Springfield, Ill.

◆ POLYPHASE watthour meters have been tested with a watthour meter comparator for approximately one year. The new polyphase comparator was introduced at almost the same time as the new line of Type P polyphase meters. A similar comparator has been used by Sangamo for all single-phase testing for over five years.

Adaptation of the comparator to polyphase meter calibration culminates a development program that began in 1950. At that time, Fred Holtz, of the Sangamo Electric Co., devised the original single-phase watthour meter comparator in an effort to reduce inherent errors in test equipment. Mr. Holtz utilized many desirable features of existing test equipments but, by graphically comparing disk speeds of meters under test to the disk speed of a rotating standard through electronics, many significant advantages were realized.

Observation errors were practically eliminated since the graphic indication permitted an observer, even with an unpracticed eye, to readily detect calibration errors of less than 0.1%. There were no revolutions to count, dials to read, or computations to be made—thus human errors were all but eliminated. No start or stop errors were possible as the equipment operated continuously during a test and calibration run. There was no guess work because the electronic comparisons of the rotating standard and the meters were graphically recorded on paper tape, thus presenting a complete test and calibration history of the meter, revolution by revolution.

With the increase in speed of testing (less than 30 minutes per rack of 40 meters) and a more reliable test, as evidenced by customer comments, it was only natural to adapt single-phase comparator equipment for testing polyphase meters. However, several difficult obstacles presented themselves.

1. Complexity of loading circuitry for polyphase meters.
2. Wider variety of test speeds.
3. Wide variety of physical sizes and terminal arrangements.

The test rack is made up of 40 test stations with load circuits connected essentially the same as a conventional gang rack. The po-

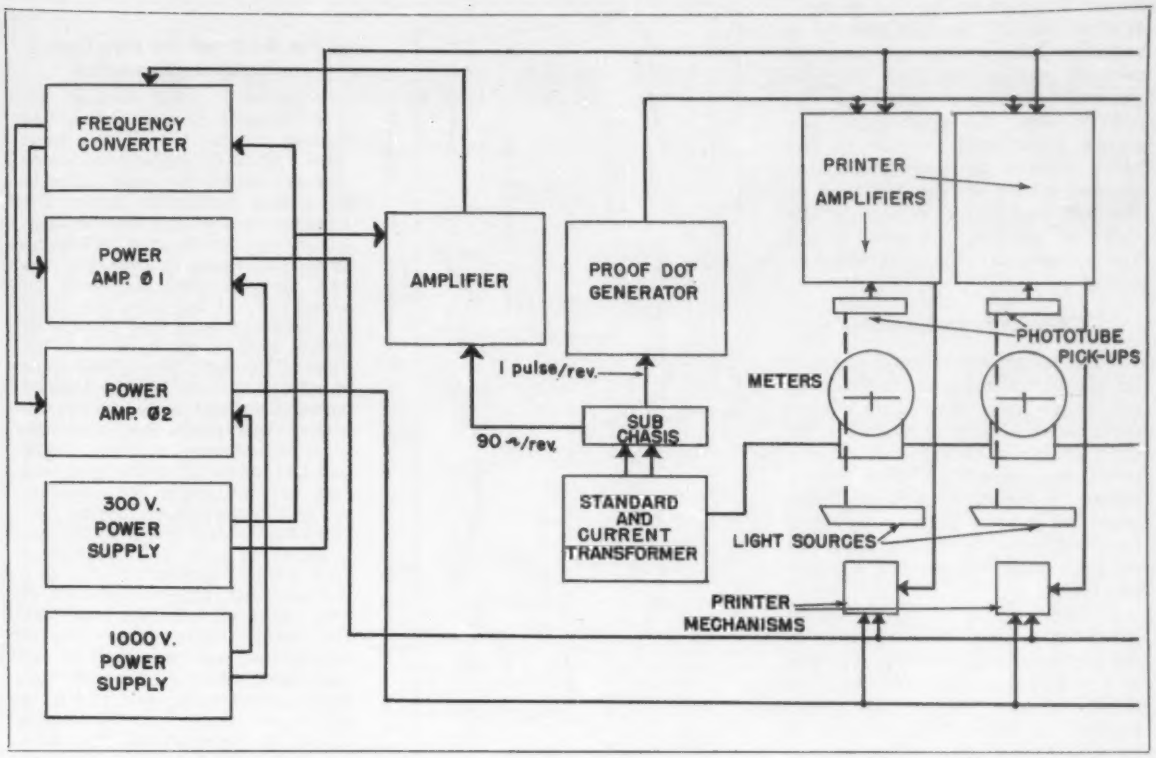


Fig. 2 — Block diagram of watthour meter comparator test equipment for testing polyphase meters.

tential circuits are connected in parallel and the current circuits are in series with the rotating standard's current transformer. Only one rotating standard is necessary for each test rack. The transformer ratios are such that the standard's speed is always in the required ratio to the correct speed of the meters and is maintained at near full load speed for greatest accuracy.

Signal output

The rotating standard is fitted with a light-chopper disk with 90 equally-spaced slots on its periphery plus a single hole on a shorter radius. Thus, by means of two phototubes, two separate signals are produced, one nearly a sine wave of 90 cycles per disk revolution, and the other a single impulse per revolution. The frequency of the 90 cycle per revolution signal from the standard is proportional to the rotation speed and is amplified and changed from single-phase to two-phase output at a relatively high power level.

This two-phase output is then used to drive a frequency converter of a geared synchronous motor-driven two-phase generator type. After selection of the appropriate frequency ratio, each phase of the two-phase output is again amplified to a power level sufficient to operate synchronous motors at each test station. These synchronous motors operate a recording drum through a 90:1 worm gear reduction, therefore the drum speed is exactly integrally proportional to that of the standard. Synchronism is assured and checked by a proof dot system which will be explained later.

Printing mechanism

The basis of the test is a comparison of the meters with the standard, hence the name comparator. The actual comparison is done at the individual test stations and is recorded on adding machine tape by the printer mechanism. The tape is progressively advanced over the recording drum which has a raised helical land of two inch pitch on its periphery.

The tape also passes under a printer bar with a typewriter ribbon between the tape and the bar. The printer bar is parallel to the axis of the drum. A dot is printed at the point of intersection of the printer bar and the raised helix when the printer solenoid is energized.

The printer bar impulse is initiated by a photoelectric pick-up from the meter. A light source is focused so that the light will pass through anti-creep holes in the meter disk. A printer amplifier chassis with an adjustable phototube pick-up attached is located directly above the meter to receive the light transmitted through the meter anti-creep holes. The impulses are amplified and fed to a pulse-division circuit which actuates the printer bar solenoid.

After the dot is printed, the tape is advanced 0.032 inch and is ready for another impulse. As the raised helix has a 2 inch pitch and the tape is 2¼ inches in width, it is impossible for a trace to be lost as a dot will appear on one side of the tape before the trace goes off the other.

If the meter and rotating standard are exactly in step, the raised helix on the recording drum (driven by the standard) will be in the same position each time the

printer bar (driven by the photo-electric cell at the test station) is actuated. This results in a straight vertical line on the tape. If, however, the standard and meters are not in step, the position of the raised helix will not be in the same relative position, and a line slanted either to the right or to the left will result. A line to the right of vertical indicates a fast meter, and to the left a slow meter.

Checking synchronism

System synchronism is checked by the proof dot system. The single pulse per revolution signal from the standard is scaled down by a carefully chosen ratio in the proof dot generator. The output pulses of the proof dot generator cause all printer bars on the rack to simultaneously print a proof dot on each tape but not to advance the tape.

If the system is operating in synchronism, the dots will fall at the same lateral location each time a proof dot pulse arrives. The choice of scale down ratio makes possible a distinctive pattern of proof dots to identify the test load being recorded. It also provides a check against gross errors, such as double or half speed meters, by noticeably changing the proof dot spacing.

Sensitivity of the system is such that if the angle of the trace is within plus or minus 45 degrees of vertical, the registration of the meter is plus or minus 0.2% on full load, plus or minus 0.4% on light load, and plus or minus 0.8% on power factor. An example and an explanation of a printed tape from an actual test of a polyphase meter is shown in Figure 3.

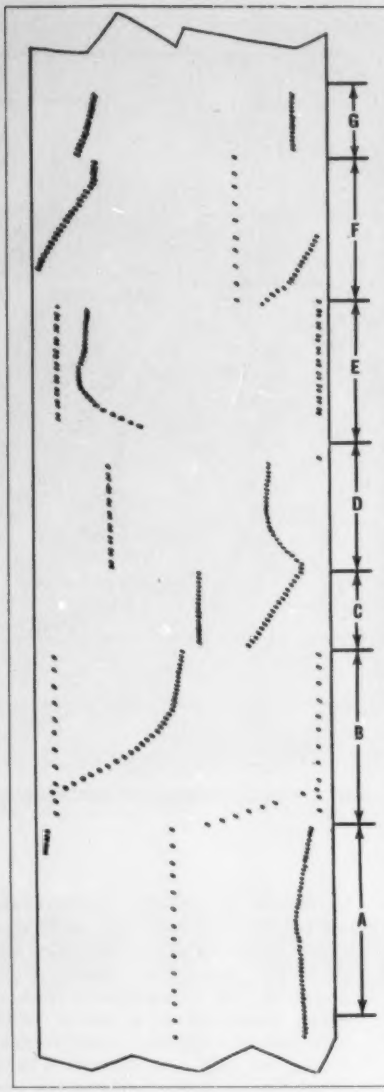


Fig. 3—Proof dot tape from actual polyphase test.

The sequence of test is from the bottom to the top of the tape. Area "A" is the right hand stator run and shows the registration to be within acceptable limits. The straight vertical line in the middle of the tape in area "A" is the proof dot trace. In area "B" the two straight vertical traces on either side of the tape are proof dot traces showing that there is no loss of trace as the trace nears the edge of the tape. The center trace in area "B" is the left hand stator balance run and shows that registration was 100.64 per cent and, after adjustment, it was 100.02 per cent. Area "C" is the light load test run and shows the meter to be within acceptable limits. The right hand stator power factor run is shown in area "D"; it indicates that initial registration was 99.0 per cent and, after adjustment, it was 100.06 per cent. In area "E", left hand stator power factor registration was initially 98.32 per cent and, after adjustment was made, registration was raised to 100.04 per cent. Area "F" again shows the arrangement that does not allow the loss of a trace on the test tape. The full load series test trace first shows on the right side of the tape and then, before the trace runs off the tape, the trace appears on the left side of the tape. In this instance, the trace initially shows registration at 100.22 per cent and, after the adjustment was made, the registration was 100.02 per cent. In area "G" the light load recheck shows light load registration is now 100.1 per cent.

Test procedures

Testing polyphase meters inherently involves more operations than testing single-phase meters. Each stator must be adjusted for correct registration and must also be balanced against the other.

A typical procedure for testing polyphase watthour meters is as follows:

1. The right hand stator adjustment is made by adjusting the damping magnet micro-adjustment screw.
2. Left hand stator balance is made by adjusting stator balance screw.
3. Light load series test adjustment is made only on right hand stator.
4. Power factor adjustment, if necessary, is made on right hand stator.
5. Same power factor adjustment on left hand stator.
6. The meter is then run on full load series test. Adjustments, if necessary, are made by slight adjustment of the full load micro-adjustment screw.
7. Light load series recheck.

During testing, potential is applied to all stators.

Advantages

This application of the comparator in testing polyphase meters is less than a year old. However the same advantages gained from comparator testing of single-phase meters are also being evidenced with the polyphase comparator. These advantages are:

Permanent record

1. Permanent record of meter performance throughout the test run, telling the story of "as found" meter accuracy, adjustments made, and stability.
2. Long test run with better opportunity to observe meter performance.
3. No start or stop errors.
4. Efficient use of operator's time in making adjustments rather than waiting for test results.
5. Greater accuracy through ease of observation of errors.

How regulators can increase revenue

◆ A HANDY METHOD of calculating a power system's increase in revenue with feeder voltage regulation has been developed by General Electric Company engineers. This includes a formula for finding the annual revenue increase in dollars for a feeder of any size, load factor, and per cent of voltage-sensitive load when the voltage is raised from any lower, unregulated value to 100% of system rating. The accompanying graph permits quick calculation of the annual revenue increase for voltage improvements of 10% or less.

The formula is particularly useful for operators of systems with long, lightly loaded feeders, where the voltage drop is considerable. The method will work no matter what the point of regulation may be, as long as the load characteristics of the portion of the feeder to be regulated are known or can be estimated.

Knowing the revenue increase, cost of regulation, and system generating costs and carrying charges, the operator can easily calculate the profitability of voltage regulation on his feeder.

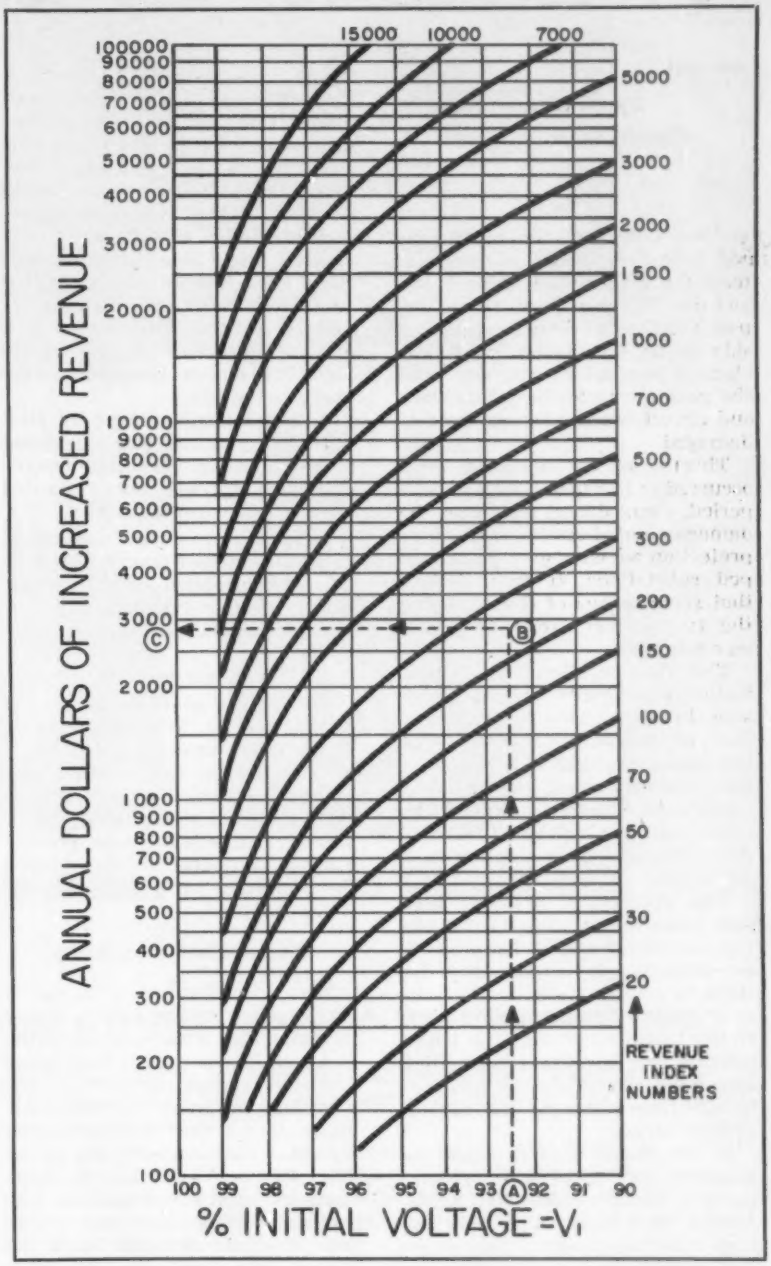
Using the graph

Increased kilowatt-hour consumption and, therefore, increased revenue results, primarily, from higher average voltage in lighting and manually-controlled heating loads. Lighting load is usually the most significant. The increase in the number of kilowatt-hours to these loads on distribution feeders has been found empirically to vary with the voltage to the 1.6 power.

The formula under the graph indicates the increased feeder revenue resulting from an increase in voltage from an initial value of V_1% to 100%. V_1 is the average unregulated voltage in per cent of rated voltage during the period when the lighting load is on. With the regulator added, the average value of regulated voltage is assumed to be 100%.

More exactly, the curves in the graph are a plot of the second equation under the graph in which "revenue index" is the product of the first four factors in the first equation.

(Continued on page 135)



❶ $$\text{REVENUE INCREASE} = \text{Peak KW} \times \text{Load Factor} \times \frac{\text{Lighting Load KWH}}{\text{Total KWH}} \times \frac{\text{Cents}}{\text{KWH}} \times \frac{1}{100} \times 8760 \frac{\text{Hrs}}{\text{Yrs}} \times \left[\left(\frac{100}{V_1}\right)^{1.6} - 1\right]$$

❷ $$\text{REVENUE INCREASE} = (\text{Revenue Index})\ (87.6)\left[\left(\frac{100}{V_1}\right)^{1.6} - 1\right]$$

Where revenue index = the product of first four factors in equation No. 1.

Protection for tap load stations

By R. W. Ohnesorge
Florida Power and Light Co.
Miami, Fla.

◆ THIS COMPANY uses many tapped load substations in order to feed its distribution. About one and one half years ago, three tapped substations experienced bus side faults. The faults eventually cleared themselves but not until the power transformers, bus work and circuit breakers were severely damaged.

This series of substation fires occurred in less than a three month period. Coincidental as it was, the damage pointed out the inadequate protection we were giving our tapped substations. It was obvious that some means of disconnecting the transformer from its source was necessary.

The ideal solution from a protection viewpoint would be a high side breaker. This arrangement was, of course, considered to be too expensive, and more economical methods were immediately considered. The first solution to be considered was high side fuses, and these actually were applied in a few cases.

This problem of applying high side fuses meets with the following considerations. If fuses are to be effective, it is necessary for them to coordinate with the feeder breakers, the safe heating curve of the transformer, and the transmission line breaker relays. High side fuses should also be relatively safe from lightning and various system surges.

It was found that it would be possible for a phase-to-ground fault on the low side of the transformer bank to result in only one high side fuse blowing. This situation would apply full voltage to one of the secondary phases and partial voltage on the others. The same condition could occur if a phase-to-phase fault persisted on the low side. The unbalance in either case could result in single phasing the load while a dangerous and comparatively slow burning fault would continue in the substation.

In general, it was finally concluded that, although fair protection was provided by high side fuses, it was by no means complete. Complete protection would be very difficult and often impossible with high side fuses.

Since high side breakers and fuses were shelved as a means for protecting these stations, there remained another alternative. This alternative was to trip the remote high line circuit breakers to deenergize the line.

A transfer trip scheme by pilot wires or by carrier was considered in order to trip the supply breakers. This approach was discarded for the following reasons:

(1) Since more than one station is usually tapped from a line section, the problem of monitoring many transfer trip channels becomes difficult and impractical.
(2) Cost
(3) Maintenance

Finally the ground switch was considered. At first, the idea of deliberately throwing a ground on a transmission line seemed impractical. Upon checking on past relay experience, the reliability of this sort of scheme was proved. Further computations also proved the economics of the scheme, and it was adopted.

The protection scheme

The specifications call for a single-phase ground switch, spring loaded, which would operate within ten to fifteen cycles. This figure has been reached successfully. For a bushing failure, it has been estimated that a fault will be cleared within twenty cycles by the use of this scheme, assuming 5 cycle breakers on the transmission line section. Within forty-one cycles from the time of initial fault, the transmission breakers will have reclosed and locked out.

In order to minimize the transmission line outage, a motor-operated airbreak switch is used to disconnect the high side of the transformer bank. This switch is comparatively slow with respect to the ground switch and will completely disconnect the bank in approximately five seconds. By this time, the transmission line breakers will have relayed, reclosed, and relayed and the line would be completely dead. After fifteen seconds, the dispatcher would reclose the transmission line breakers in order to pick up the other transformer banks on the line and to complete the transmission system.

The protection at the substation was designed on a unit basis. Each three-phase transformer has its own ground switch, motor-operated airbreak, and cabinet of protective relays. This outdoor cabinet is located near the transformer it protects.

The standard ground switch relay cabinet includes the following:

(1) Four very inverse time overcurrent relays (a tap range of 4-16 amps)
(2) One instantaneous relay (10-40 amps)
(3) One control switch that can operate the motor-operated airbreak switch
(4) One control switch which can close the ground switch
(5) One single throw spring return fault pressure relay reset switch
(6) One lockout relay (125 volt d-c)
(7) Seven 125 volt d-c lights for indication

Current coils of three of the four time overcurrent relays are located in the metering current transformer circuits. These relays are set to coordinate with the feeder breakers and the safe heating curve of the transformer. The main purpose of these relays is to operate for phase-to-phase faults or three-phase faults that occur on the bus. Also, they may operate as back-up relays if a feeder fails to trip on feeder faults.

The size of current transformers used are of standard sizes and depends upon the size of the transformer. These current transformers will be of the bushing type in the new transformers. Outdoor metering current transformers are used with the older transformers not supplied with bushing transformers.

The other time overcurrent relay is used as a ground back-up

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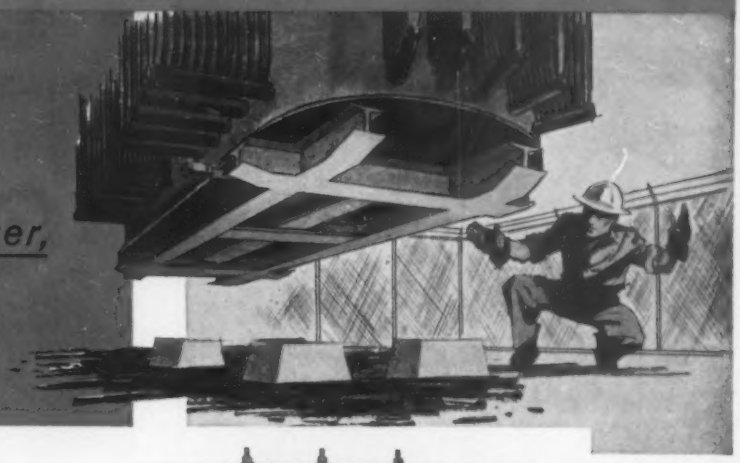
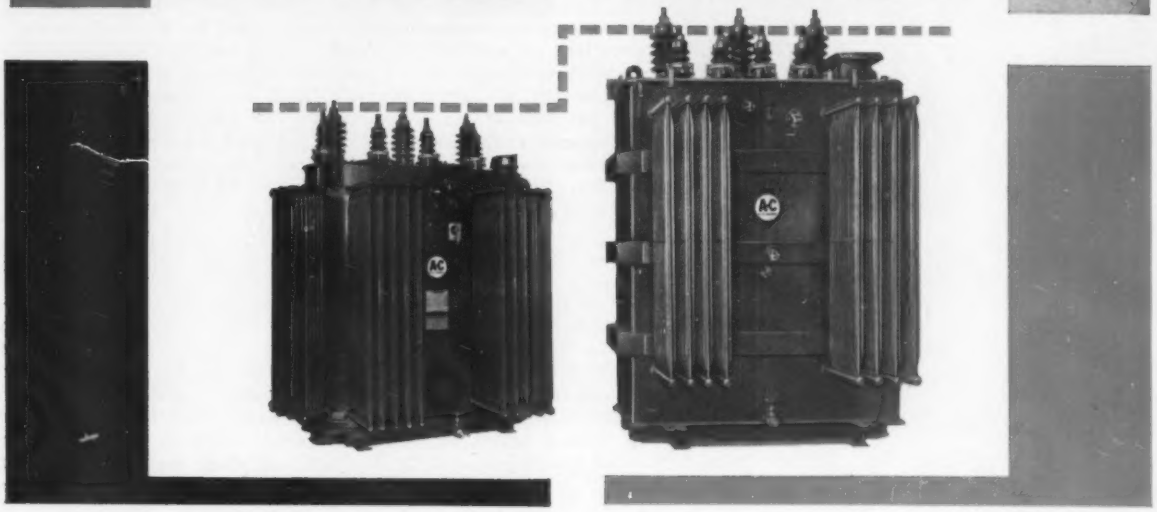
Easier to install because they're 30% lower, lighter too!





NEW

Allis-Chalmers small power transformers

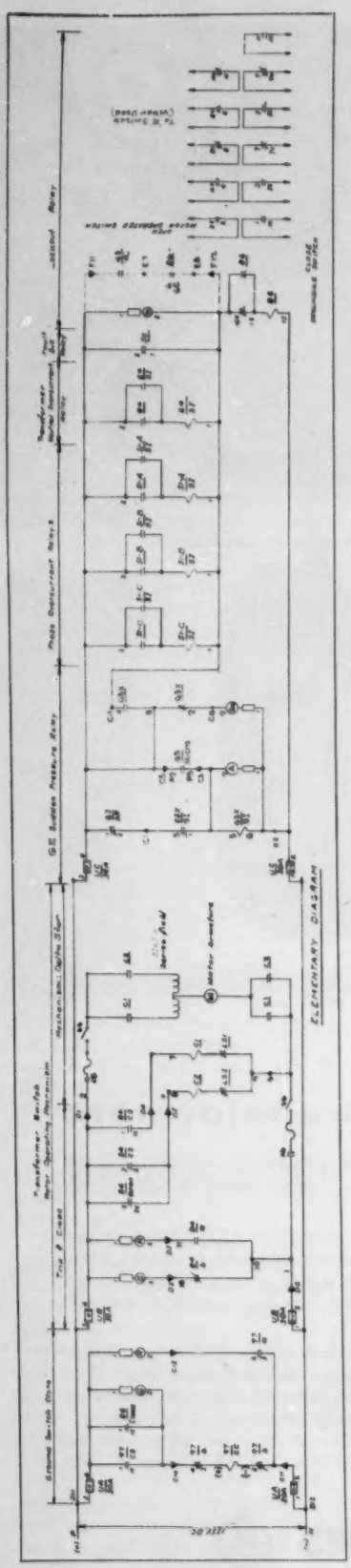
Goodbye to building high-cost foundations — engaging extra-heavy-duty handling equipment — all to install "small" power transformers.

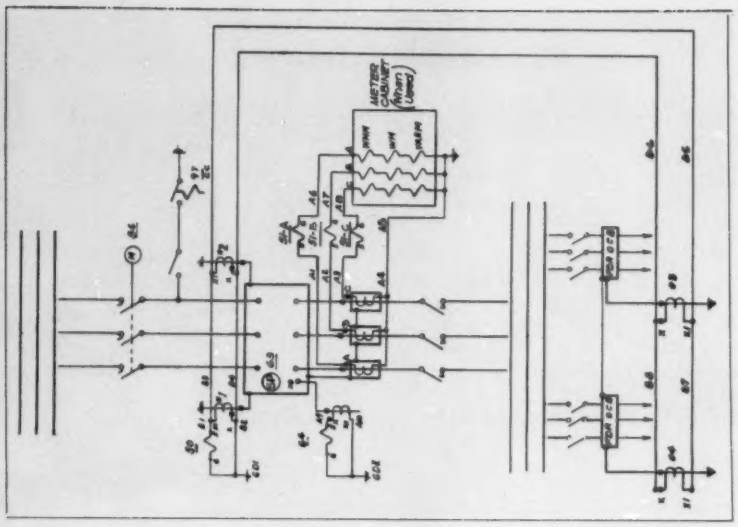
All new — these lighter, lower units by Allis-Chalmers bed down on a thinner pad, low cost piers or concrete planks. Handling is simplified by the weight-saving design. (The 34.5-kv, 3750-kva transformer, for example, has had its weight reduced by 8000 lbs.)

Easier servicing is another basic advantage of this new design that also reduces losses, exciting current and noise level. The unit is reinforced from the inside, offering a smooth, clean appearance — no disfiguring, dirt-gathering external bracing.

Get the complete story from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS A-1179-E





At left is an elementary diagram of control wiring for the transformer and bus protection scheme utilizing a grounding switch. Directly above is the corresponding three-wire a-c diagram of the tap load station and its protective equipment. Items of special interest in the diagrams may be identified by numbers as follows: (43) "R" switch; (50) fault bus overcurrent instantaneous time relay; (51) phase overcurrent time delay relay; (63) sudden pressure relay; (64) transformer neutral overcurrent time delay relay; (84) operating mechanism; (86) lockout relay; and (97) grounding switch, spring loaded.

relay with its current coil in series with the secondary of a current transformer in the transformer neutral. This relay coordinates with the ground time relay in the feeder breaker. This relay will operate on ground faults of the transformer or bus not cleared by other relays.

Special grounding

One instantaneous relay is tied into the special fault bus scheme from the paralleled through current transformers. In this fault bus scheme, the heavy ground connections go through the fault bus current transformers. The power transformers, feeder breakers, and external metering current transformer cases are all grounded through these current transformers.

No metallic conduit is allowed to make connection to the above equipment and ground. No wiring is connected to the frames of the equipment protected. The foundation bolts are not tied onto the ground bus as this equipment rests on the concrete and any other low resistance ground could bypass much of the fault current and reduce the sensitivity of the scheme.

Micarta washers are used when mounting outdoor current transformers in order to insulate them from the structure. The cases of these current transformers are tied together and the common connection tied to the power transformer. This will allow any fault in the metering current transformers to go through the fault bus current transformers of the power transformer. If tests indicate a low ground resistance, other than the actual ground connections, steps are taken to raise this resistance.

The motor-operated airbreak can be operated from the ground switch relay cabinet by means of a control switch. This switch is provided for maintenance purposes and allows convenient switching of the transformer. This switch can also be used for emergency clearing of the transformer bank. Position indication lights are provided.

The control switch for the ground switch is provided for maintenance purposes only. The ground switch can be reset with a standard switch stick. A single blade disconnect is located in series with the ground switch. This disconnect can be opened when testing the ground switch. The

ALLIS-CHALMERS... Pacing Power Progress

Small size saves panel space.

FIRST

completely static protective relay!

. . . available in Allis-Chalmers switchgear

This highly reliable *new* protective overcurrent relay has no moving parts . . . it's static, and it's only ⅓ the size of conventional relays.

Employing transistors, printed circuits, and other electronic components encased in epoxy-resin, A-C static relays are shock and moisture resistant They're unaffected by temperature changes, operate with low burden, and have instantaneous reset feature. Quick plug-in construction makes replacement easy.

Want more protective relay-equipped switchgear facts? Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-1157-E

ALLIS-CHALMERS

A-C Introduces New Static Relay

COLLEGE STATION, Texas, April 13 — Over 300 relay engineers and scientists witnessed another example of the Electronic Age today when Allis-Chalmers introduced a new static protective relay. The new development was disclosed in an engineering paper presented by John Baude, Allis-Chalmers engineer, before the Twelfth Annual Conference for Protective Relay Engineers.

The new relay, designed for industrial switchgear application, is the first major departure from conventional relay construction in 50 years.

NO MOVING PARTS

Of particular significance is the elimination of all moving parts through the use of semi-conductors such as transistors, diodes, thermistors, and varistors. Use of these components combined

lights above the control switch show the position of the ground switch.

Sudden pressure relays

A sudden pressure relay is provided on each transformer. Operation of the relay will trip the lockout relay and seal in. The indication lights, of course, will change and the relay will be "sealed in" until reset by the reset switch. The General Electric model is used with an auxiliary relay mounted in the rear of the relay cabinet, while the Westinghouse has its "seal in" self contained.

The sudden pressure relays are designed to operate on a sudden change of pressure inside the transformer. This sudden pressure relay will detect most faults within the transformer including turn-to-turn shorts. Turn-to-turn faults will not be detected by the relays in the standard scheme.

The lockout relay used is a conventional General Electric master relay which will be energized by any of the before mentioned relays. This lockout relay is supervised by a single blue light immediately above the reset handle. When this relay operates, the ground switch coil is energized to release the spring which will close the switch to ground. The second function of the relay is to start the motor-operated airbreak switch to open. In stations where supervisory control is available, a contact of this lockout relay is used for annunciation on the supervisory control.

In many stations, two or more power transformers are used and each transformer is treated as a unit. If the distribution buses of two or more transformers are tied together, it is done through load break switches. Below these load break switches and to one side is located the "R" switch. This switch is manually operated only when the load break switches are operated, and both are operated only with dispatcher's orders.

The "R" switch is locked with a standard switch lock and is simply pushed closed or open. The electrical connections to this switch simply tie the lockout relays of the two units together when it is closed. This is obviously necessary when the load break switches are closed. Trouble is not anticipated in resetting the lockout relays, as the first action in a faulted substation would be to clear the damaged section by opening the load breaks. Since a dispatcher's order is necessary for this operation, the dispatcher will also order the "R" switch opened.

Where future plans call for a high voltage bus station and large transformers are now used, differential relays may be installed around the transformer and bus. This scheme, of course, deviates from the standard, but the lockout relay still will operate a ground switch and motor-operated airbreak switch.

At one of our large generator installations, the start-up transformer is tapped from a line without a high side breaker. A standard differential scheme is used around the transformer but a ground switch and airbreak switch is used to clear the high side of the transformer from the line. As in the standard scheme, the line can be returned to service after approximately five seconds. The lockout relay will open the circuit breaker as in any standard differential scheme.

In case the line trips out because of a permanent fault, another airbreak switch is available. This airbreak is controlled by a control switch in the substation control room which will open the line beyond the start-up transformer. This will allow the return of the transformer to service. A voltage relay has been provided in order to prevent the line from being opened by the airbreak when the line is energized.

Testing the installations

The overcurrent relays are tested in the conventional manner with current and cycle counter. All wiring is checked against the standard drawings. The lockout relay is checked for minimum and normal voltage and current.

The ground switch is tested for minimum and normal voltage and current. With normal voltage applied, the switch is timed for closing from the time the coil is first energized till the ground switch actually makes up. If this time is not within 15 cycles, readjustments are made to make it conform.

An excitation test is performed on all current transformers separately. This provides data for future tests and for any questionable actions that may occur. A polarity test on each transformer is always done on a new installation. A ratio test is done when possible. If bushing current transformers are already installed in the transformer, the excitation tests alone are performed along with making certain that the tap connections are correct.

The fault bus is checked with the equipment deenergized. Resistance readings are taken between the equipment and the actual ground bus with the main grounds removed temporarily. If these readings fall below five ohms, the equipment is further checked to find out what is causing this low reading. Often times, especially in older installations, the mounting bolts are tied to the ground bus within the concrete. In cases of this type, it is necessary to insulate this bolt from coming in direct contact with the equipment. A reading of forty ohms or better is the usual case, but it is calculated that a parallel path as small as three ohms would be enough to operate the instantaneous fault bus relay if the ground bus is well tied together. The resistances between the actual ground leads are checked to be close to zero.

The sudden pressure relay is checked electrically and mechanically. If any question arises as to its correct operation, the relay is replaced and the defective relay returned to a shop for further checking.

An over-all check of all protective relays, ground switch, and motor-operated airbreak is performed in order to insure correct operation. If no questions arise as to the correct operation of all equipment, the scheme is placed in service.

Routine maintenance on the entire scheme will be done annually including resistance checks. The ground switch will be checked for minimum operation and time every six months until more representative test data has been obtained.

Experience data

This ground switch protection is going in service in about 150 substations. At present, about fifty per cent of these are in service.

To date, we have had five correct actions of this ground switch. In two cases, bus side bushing failure initiated the action. In another, a wire belt had been thrown into the distribution operating bus. A power transformer developed a turn-to-turn fault at another sta-

(Continued on page 133)

ALLIS-CHALMERS... Pacing Power Progress

Proof—
Allis-Chalmers distribution transformers mean more revenue

COMPARISON OF EXCITING CURRENT VALUES

5 kv and below (Test data from 2400-volt units)			Above 5 kv (Test data from 7200-volt units)		
Kva	Previously published	New guaranteed value	Kva	Previously published	New guaranteed value
5	3.2	3.0	5	3.5	3.0
10	2.7	1.5	10	3.0	1.5
15	2.1	1.5	15	2.6	1.5
25	1.7	1.5	25	2.0	1.5
37½	1.6	1.0	37½	1.8	1.5
50	1.5	1.0	50	1.6	1.5
75	1.5	1.0	75	1.5	1.0
100	1.5	1.0	100	1.5	1.0
167	1.4	1.0	167	1.5	1.0

EXCITING current cut as much as 60%

Reduction of exciting currents . . . by as much as 60% . . . means Allis-Chalmers distribution transformers give you greater system efficiencies four ways:

1. Generating capacity requirements are cut. Only minimum amounts of nonrevenue-producing exciting current are needed.
2. Lower exciting currents help reduce copper loss on transmission lines.
3. Your system carries a higher amount of revenue-producing power.
4. Reduces need for system power-factor corrective equipment.

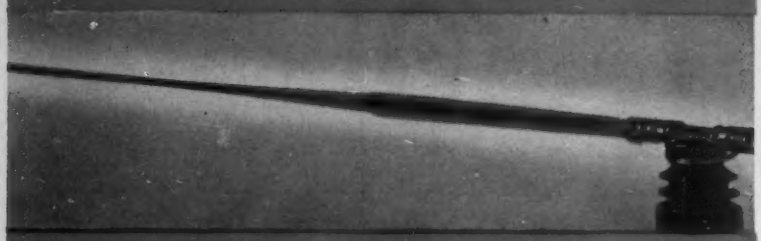
The new Allis-Chalmers guaranteed values are available to you in all A-C distribution transformers up to 167 kva . . . in all voltage classes.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

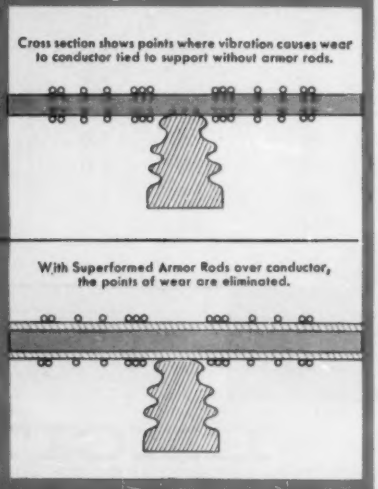
A-1202-E

TAKING THE PUNISHMENT OF WIND VIBRATION



FANNER *Superformed* ARMOR RODS

• CUSHION CONDUCTORS against DAMAGE!


Cross section shows points where vibration causes wear to conductor tied to support without armor rods.
With Superformed Armor Rods over conductor, the points of wear are eliminated.

Even at low wind velocities, overhead lines are often subjected to thousands of stress reversals per minute due to aeolian vibration.

With Fanner Superformed Armor Rods installed at points subject to stress and abrasive wear, the conductor receives the best protection against vibration damage as well as electrical burning . . . and many expensive line repairs are eliminated.

Fine Fanner Superformed Products

ARMOR RODS · FANNSPLICES · FANNGRIPS
LINEGUARDS · PATCH RODS · TAP ARMOR
PLASTIC FANNGUARDS · KOVERGARD MOLDINGS

THE FANNER MANUFACTURING CO.
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Electrical Products Division

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*Trademark

THE MAGAZINE For SOUTHERN ELECTRICAL MEN Is . . . ELECTRICAL SOUTH

Each month thousands of men engaged in the electrical industry throughout the South-Southwest meet through the pages of ELECTRICAL SOUTH for discussion and solution of mutual problems . . . presentation of new ideas and suggestions.

Why don't you join this monthly get-together? The modest subscription price of only $3.00 for THREE full years of informative, value-packed reading is an outstanding investment in your future.

If you aren't a subscriber, become one —or, if your subscription is about to lapse, renew it! The small expense will be returned to you many times in the thousands of pages of valuable information that will be yours for the next three years.

ELECTRICAL SOUTH
806 Peachtree St., N.E.,
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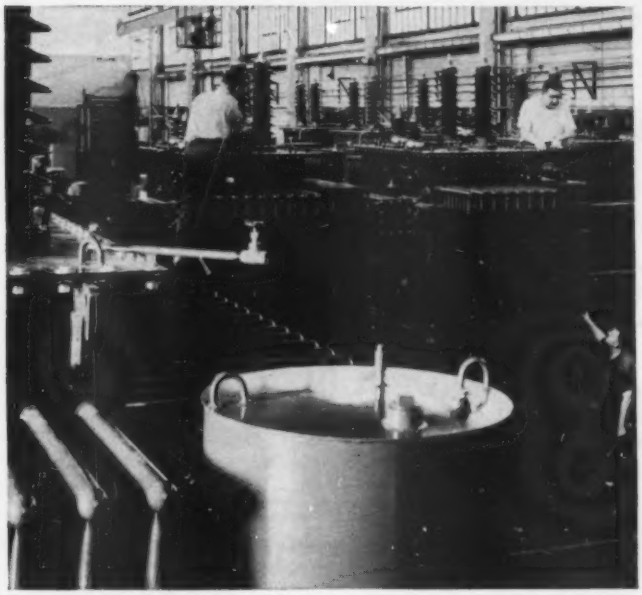
SAVE . . . and GET FASTER DELIVERY

with Kuhlman standard ASA power transformers



You save time and money when you order Kuhlman ASA standard medium transformers (through 10,000 KVA, 69 KV). There's little or no engineering time. Production costs are lower. Quality is high and uniform. Delivery is faster. It pays to specify *Standard Kuhlman.*

However, when the job calls for some deviation from the standard, Kuhlman's unique capabilities are even more valuable to you. Here you get engineering and manufacturing flexibility that is able to meet your special needs without delay or undue loading of costs.

Whether your order is for standard or non-standard transformers, you'll get fast service, close pricing, and assured satisfaction from Kuhlman—transformer specialists for 65 years.

Be sure to get a quote from Kuhlman!

KUHLMAN POWER TRANSFORMERS

KUHLMAN ELECTRIC COMPANY General Offices: Birmingham, Michigan
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DESIGNED FOR ALUMINUM

HIGHEST QUALITY

FARGO "9000" SERIES

"One-piece" aluminum connectors

CAREFULLY INSPECTED

UNIFORM DEPENDABILITY

EASY TO USE

FOR ALUMINUM TO COPPER

Bimetal inserts of pressure welded aluminum and copper sheet. Excellent conductor encirclement and separation.

FOR ALUMINUM TO ALUMINUM

Pure aluminum spacer gives high conductivity. Extra wide contact surfaces. Large mass for heat dissipation.

LONG, LONG LIFE

Ask your Line Material Field Engineer for complete details.

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LINE MATERIAL INDUSTRIES
(A McGraw Edison Company)
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

For Winter Olympic Site:

New Allis-Chalmers 3-phase SFR Distribution Regulator

Workmen are busily putting the finishing touches on pastel-shaded dormitories, ski tows, ice rinks and, of course, the electrical system at Squaw Valley.

Here in a narrow, steep-sided valley high in the California Sierras will be held the Winter Olympics a short time from now.

The new, compact, weight-saving three-phase distribution regulator design by Allis-Chalmers was selected as the ideal solution to their voltage regulating problem.

- These units save 33% space; cost 30% less per kva of 3-phase regulation; weigh 20% less; provide 160% *Vari-Amp* rating to 600 ampere maximum.

For help in revaluating your present substation planning, contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-1150-E

Smaller conductors gather thicker ice

◆ TRANSMISSION of extra high voltage electricity has resulted in the use of larger diameter conductors and the natural assumption would be that the larger conductors would accumulate thicker ice in winter.

But it does not appear to be so, four engineers reported at a transmission and distribution symposium during the Fall General Meeting of the American Institute of Electrical Engineers held recently in Chicago. The four reported on ice tests of conductors from one quarter of an inch to one-and-three-quarters inches in diameter and came to the conclusion that the smaller diameter conductor gathers thicker ice.

The tests were made at the Aluminum Company of America's Cleveland Works, and at Massena, N. Y. The tests were made originally in a laboratory at Massena, then the equipment was dismantled and sent to Cleveland for further testing.

"The tests indicated that the ice thickness is fairly constant on medium and large size conductors, but that ice thickness is greater on the smaller conductors," reported E. K. Lanctot and H. E. House, Aluminum Company of America, and E. L. Peterson and E. S. Zobel, American Electric Power Service Corp., New York. "For example, a fairly uniform thickness of ice was formed on the test conductors with diameters in the range of 1 in. to 1¾ in., but this thickness was about 20 per cent greater on the smallest conductor tested, which was ¼ in. in diameter."

They pointed out that the tests were not conclusive, but hoped that others will make similar experiments and that reports will be made on actual ice conditions.

* * *

ELECTRICAL OUTAGES during cold weather and during the air-conditioning season cause the most resentment among customers, AIEE members were told in a paper on "Application of Planning Criteria to the Determination of Generator Service Dates by Operational Gaming." The authors were C. A. DeSalvo, Westinghouse Electric Corp., East Pittsburgh; C. H. Hoffman, and R. G. Hooke, Public Service Electric & Gas Co., Newark N. J.

As one of their steps in planning for future expansion of Public Service they queried top supervisors in the eight field operating divisions of the company on customer attitudes toward outages.

"In comparison with outages during the mild weather periods in spring and fall, outages during the summer air conditioning season cause twice the resentment, and those occurring during the winter heating season five times the resentment," they reported.

Other factors causing dissatisfaction among customers was the frequency of outages, the effects of this frequency, magnitude and effect of the magnitude of outages, the durating of outages, effect of the time of day of the outages, and the effect of the awareness of the causes for outages.

Customers resent more than one outage yearly; resentment rises rapidly after a six-hour outage and "multiplies very rapidly after 24 hours"; outages between 6 p.m. and 11 p.m. cause 2½ times daytime outages, but those occuring between 11 p.m. and 7 a.m. cause only about a third of the resentment caused by day-time outages.

"The resentment caused by an unexplained outage" they reported, "is nearly three times that resulting from a natural catastrophe. The obvious conclusion is that an outage should be followed by a prompt explanation of the reason to the customer involved, whenever and to the extent practicable. Another conclusion is that it is somewhat more important to avoid outages resulting from personnel or equipment failure than it is to avoid storm trouble, except for the effect of storms on frequency, magnitude, and-most important-duration of outage."

* * *

A GRADUAL INCREASE in the use of gas filled transformers was predicted during the AIEE Fall General Meeting.

The advantages of gas as a transformer insulation over liquids, such as oil, were listed as follows by three General Electric Company engineers; (1) Gases being used or proposed are not combustible. (2) Although gas may decompose during accidental internal arcs, the pressures developed are only a fraction of those produced by the same arcs in liquid filled transformers. (3) In gas filled transformers, the pressure relief device is much more reliable because of the small mass being moved during the fault and the compressible character of the gas.

Large numbers of liquid filled transformers are in successful operation and "the use of oil or askarel in power transformers is well justified," said G. Camilli, L. G. Littlejohn and W. A. Wooridge, of Pittsfield, Mass. They added that "their use needs no apologies."

"It appears that gas insulated transformers provided with relief diaphragms are virtually free from the danger of tank rupture under the action of heavy electrical arcs," they concluded after reporting on tests of transformers. Their paper was titled, Internal Fault Characteristics of Gas-Insulated Transformers.

* * *

LOAD INTERRUPTERS and power fuses, enclosed in metal housing "offer an economically optimum solution to switching and protecting high-voltage power supply circuits" in industrial and commercial buildings, the AIEE meeting was told. Use of these devices are approved in the 1959 National Electric Code.

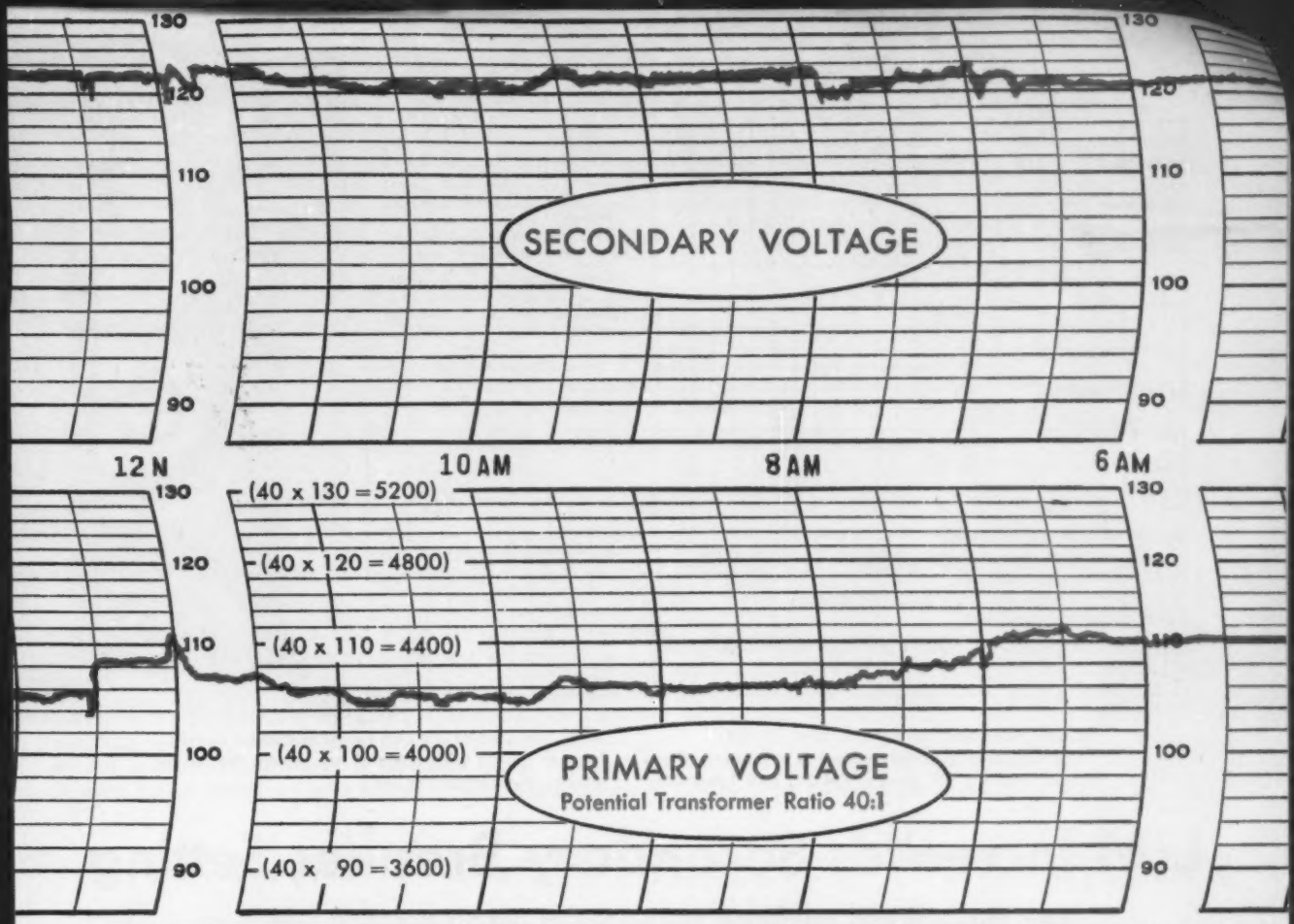
C. H. Baker and J. J. Mikos, of S & C Electric Co., Chicago, told an industrial and power systems symposium that because more electric power is being transmitted over long distances and at higher voltages in industrial and commercial buildings, "switching ability and short circuit protection at the 2300 volt to 15 kv levels take on increasing importance," but raises some economic questions:

Does the switchgear involved represent an adequate or inadequate investment for the actual need? Does it represent an extravagant investment for the actual need? Their paper was titled, "Matching metalclad switchgear to high-voltage industrial and commercial building requirements."

They pointed out that the economic implication of overbuying or underbuying switchgear capability is compounded by the fact that they are purchased with capital funds, rather than current operating expense dollars. In other words, for each dollar spent on switchgear, the company must earn two dollars, because of taxation.

"The importance of capital dollars for electrical equipment is in-

(Continued on page 134)



THESE VOLTAGE METER CHARTS were recorded between 6 A.M. and 12 noon on an average work day. Although the primary voltage varied between 4160 volts and 4500 volts, the output voltage of the SRT remained between 120 and 124 volts.

L-M SRT® Provides Simple Solution For Regulation at Industrial Plant

Recognizing SRT as an engineering development and realizing its possibilities for future customer requirements, Cleveland Electric Illuminating Company installed a Line Material SRT (Self-Regulating Transformer) at the end of a primary feeder.

A 37½ kva load was supplied to an industrial plant by one of Cleveland Electric Illuminating Company's 4340 volt primary feeders. This plant was located on the last third of the feeder and was subjected to variations in primary voltage. As in all industrial loads, the demand factor further complicated the situation. This 3-wire, single-phase, 120/240 volt load had primary voltage variation between 4160 volts and 4500 volts during the working day.

Cleveland Electric Illuminating Company decided to try a test installation of a Line Material SRT. The Adapt-a-Tap range was selected to permit fully automatic control within a primary voltage band in excess of 8 percent. The midpoint was set at 121 volts with a band width of four volts.

After the SRT was installed, the metered secondary voltage of this industrial load remained within the band from a fraction of a volt less than 120 volts to a fraction of a volt more than 124 volts, while metered primary voltages varied between 4160 volts and 4500 volts.

Get Data on the SRT

Line Material's SRT can solve an unlimited number of regulation problems where the solution is most imperative *at the load.* For information on how the SRT can solve your regulation problems, contact your L-M Field Engineer; or write Line Material Industries, Milwaukee 1, Wisconsin.

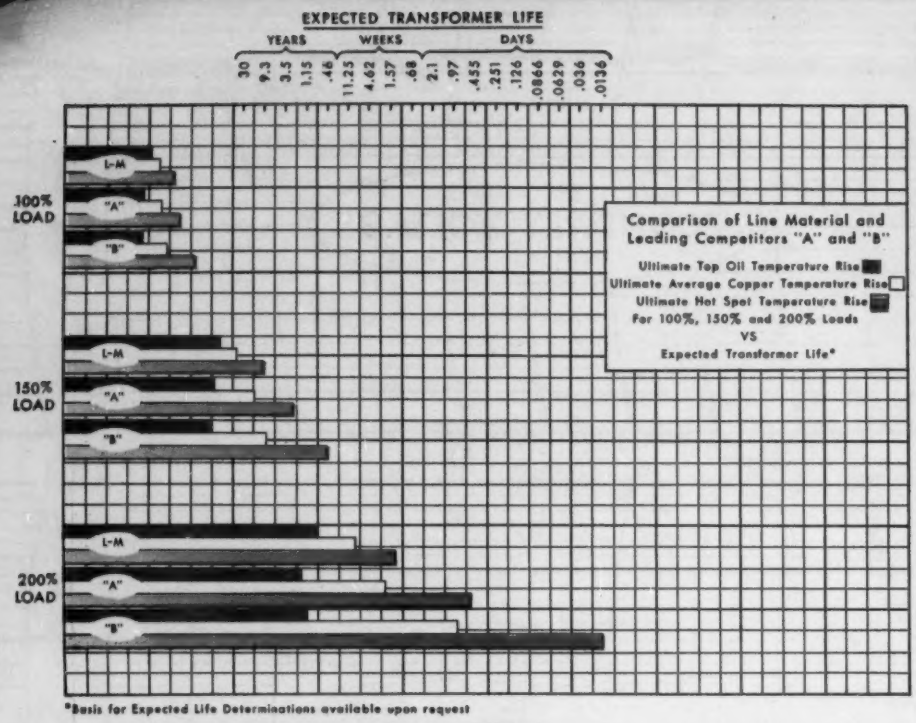
THIS 37½ KVA SRT was installed in a vault adjacent to the industrial plant. Secondary runs were short and voltage regulation with the SRT was improved.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

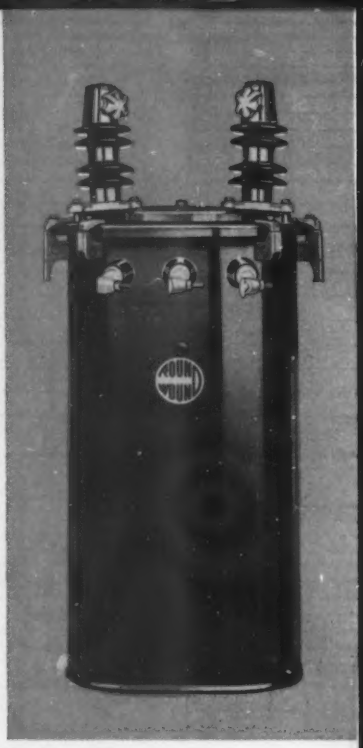
McGRAW EDISON

This is L-M's Transformer Silver Anniversary

421



*Basis for Expected Life Determinations available upon request



BASED ON AIEE TRANSACTION PAPER, "Life Expectancy of Oil Immersed Insulation Structures," volume 72, pages 924-29, and laboratory tests, transformer life can be estimated by comparing bar length with scale at top. (Note: the longer the bar, the shorter the life.)

L-M Increases Secondary Breaker Setting

Low winding and insulation temperatures permit uprating L-M transformers without any sacrifice of transformer life expectancy.

by **A. R. WAEHNER**
Director
Transformer Product Sales
Line Material Industries

During the past year, much has been claimed about improved transformer insulating materials and systems. This has led to confusion and justified concern on the part of many users who are interested in the long life of distribution transformers.

The anticipated life of a transformer is not governed *solely* by the insulating materials used therein—but, just as importantly, by the temperatures at which they operate. The *design* of the core and coil structure that permits the *most rapid removal* of the heat generated within the winding results in the lowest insulation temperature.

Rapid extraction of heat from the vulnerable areas of the coil reduces the internal copper temperature that causes insulation deterioration, thereby extending life expectancy.

High Top Oil Temperature

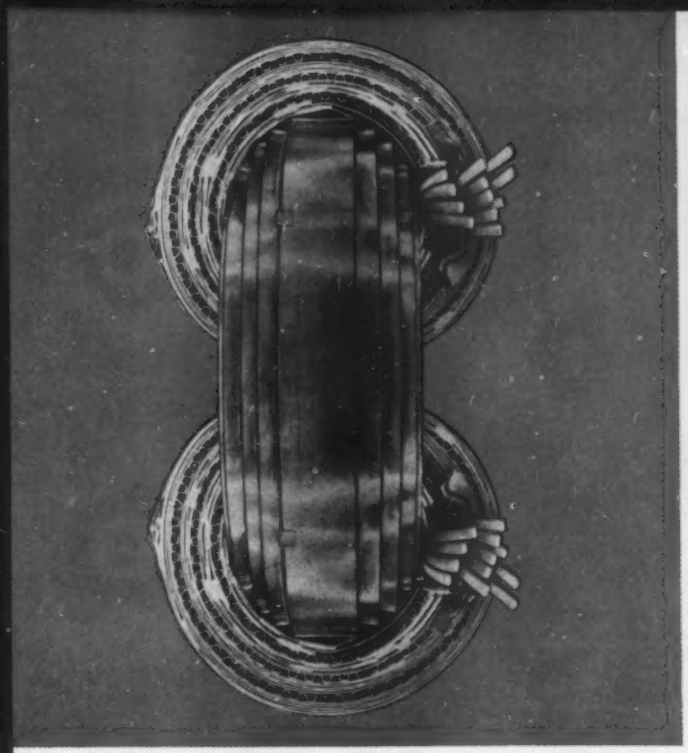
The inherent characteristics of the Line Material Round-Wound® design create *higher* top oil temperatures and lower copper temperatures than in other designs with the same total losses. This is an *advantage* and not a *disadvantage*, as it proves the rapid removal of internally generated heat. Just as hot beverages placed in a thermos jug cool slowly, in like manner other designs of cores and coils restrict the release of generated heat to a greater degree than in the Round-Wound design. Because we transfer heat to the oil more rapidly, the Round-Wound hot spot temperature is reduced, overload capacity is increased, insulation is not jeopardized, and life expectancy is extended.

Another advantage of higher top oil temperature is the more rapid dissipation of transformer heat because of the *higher* gradient between tank wall and ambient temperature of the surrounding atmosphere.

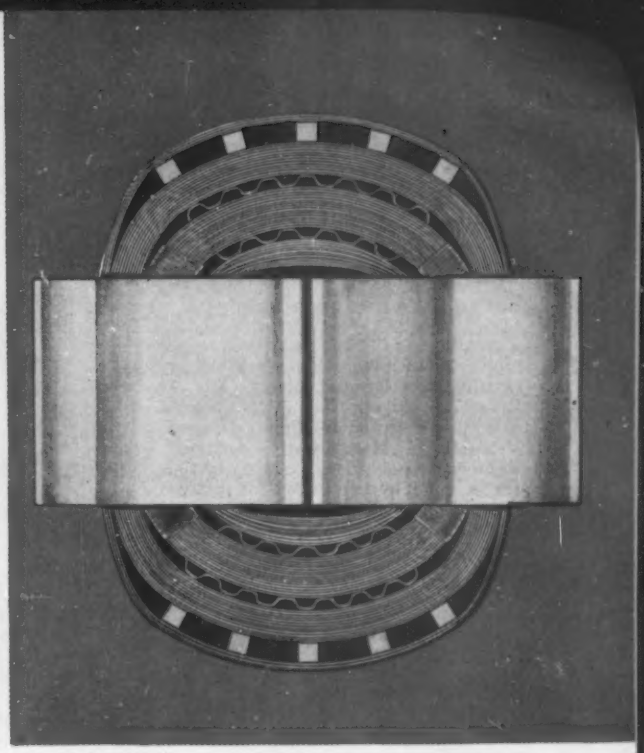
The illustrations on these pages clearly reveal a vastly greater percentage area of coil exposure to cooling oil than in competitive designs. Note, also, the many strategically located cooling ducts.

Low Temperature Gradient

Fast heat transfer in a Round-Wound core and coil rapidly raises top oil temperature *closer* to the hot spot temperature. The degrees difference is known as "temperature gradient" and is lower in the Round-Wound design than in any other make of core or shell type transformer available today. Low temperature gradient is a most significant factor contributing to long transformer life,



THIS END VIEW shows how L-M's exclusive Round-Wound design permits more oil ducts and exposes maximum cooling surface area. Winding heat is transferred more effectively than by other designs.



THIS END VIEW shows how shell type window dimensions prohibit oil ducts on the inside where heat build-ups occur. Only L-M's Round-Wound design provides concentric cooling.

on Round-Wound-Protected Transformers

especially at times of heavy overload when transformers are most vulnerable to high insulation temperatures. To take the ideal condition, if the gradient were zero degrees, heat would transfer instantly, top oil temperature would be higher, hot spot temperature would be lower, and the ultimate in life expectancy would be attained.

Laboratory tests of modern competitive samples compared with the Round-Wound design prove conclusively that at periods of heavy overload, the Round-Wound hot spot temperature is lower than with any other modern competitive design. In fact, it is *less* than the average copper temperature of at least one leading make of transformer. This is dramatically revealed in C. R. Acker's technical article in the September-October, 1959 issue of THE LINE Magazine.

Continuing Research

As a pioneer in long insulation life, Line Material, in 1951, was the first manufacturer to introduce oxidation resistant transformer oil (ORTO®). Our research and design engineers, with the assistance of Thomas A. Edison Laboratories, maintain a continuing search for improved insulation systems. If and when we find a better system, we will adopt it. The insulation system employed in the Round-Wound design, since its inception, is the finest available. The Round-Wound transformer you buy today will provide equal or greater life, under any comparable loading conditions, than any other transformer available in the industry today, *without* the necessity of a design change.

Higher Secondary Breaker Settings

Throughout the years, our Round-Wound units have enjoyed liberal overload capacity with breaker settings in line with those dictated by the current usage in the industry. Our RWP® breaker settings have been recalibrated to be as high as or higher than those offered by any other major manufacturer today. Transformers with this new breaker calibration will be identified with this symbol ≠ following the Kva designation.

The same confidence in the longevity of Round-Wound conventional transformers may be expected because the core-and-coil designs are identical.

Get Complete Information

Ask your L-M Field Engineer for the complete story on why the RWP transformer can have increased secondary breaker settings without a new design or without new insulation. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries *Transformers*

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

422

Notes on new utility equipment

Two new polyphase meters added to company's line

ADDITION of two new polyphase meters has completed the V-60 meter family from General Electric Co., 1 River Rd., Schenectady 5, N. Y.

Both new models—the V-65 and V-66—are class 200 meters designed to measure polyphase loads up to 200 amperes without the need for instrument transformers. Their addition to the General Electric meter line provides the company with a family of four types capable of handling virtually all polyphase metering applications.

Designed for four-wire delta operation, the V-66's rated speed is 8 1/3 rpm with 60-ampere turns in the current coil. It has a watthour constant of 28.8, a register ratio of 6 17/18, and a maximum temperature rise of 55°C at 200 amperes.

The V-65 three-phase meter is designed for the circuit obtained from a bank of three power transformers connected in wye.

Incorporating the same basic design as the I-60 electromagnetic assembly, the new meters are equipped with a new current-coil design which enables them to handle up to 667 per cent of test amperes with straight-line accuracy. Improved accuracy is achieved by magnetic isolation of the current circuit from the potential circuit.

Both the V-65 and V-66 are available for either bottom or socket connections.

Write U-1101 on reply card, pg. 19

Framing hardware features economy assembly methods

MAKING THE ECONOMY features of the MIF grid gain assembly methods available for dimension timber framing, several newly developed load transfer pieces are announced by Pole Hardware Div., Malleable Iron Fittings Co., Branford, Conn.

Particularly versatile are the new MIF adjustable crossarm gains for use on single or double dimension

WHY G-E FUSE LINKS GIVE MAXIMUM SYSTEM PROTECTION

By D. L. McINTIRE—Lightning Arrester and Cutout Product Planning Specialist

General Electric universal fuse links give you maximum overcurrent protection on distribution systems. Designed for use in every type of cutout, these fuse links are available in fast (K), slow (T), EEI-NEMA Types from one to 100 amperes, and high-surge links up to eight amperes. Ratings of 140 and 200 amperes are available in the solid-head type only.

General Electric universal fuse links offer you these important advantages:

Premature melting is eliminated by silver plating threaded parts to maintain low contact resistance.

Efficient low-current operation is assured by the bonding process and a specially prepared paper in the auxiliary tube.

Fuse withstands continuous overcurrents. General Electric EEI-NEMA fuse links will withstand continuous overcurrents of approximately 150 percent of rating.

Instant separation is assured by new internal spring that prevents cable fouling inside the auxiliary fuse tube.

Drop-out interference is eliminated by the use of a flexible cable. Fine-stranded cable can be used since the G-E fuse element has excellent temperature control.

Like more details? Contact your G-E Sales Engineer today, or write to Sect. 435–23, General Electric Co., Schenectady, N.Y.

GENERAL ELECTRIC

Overcurrents are

arm "H" frame structures. An easily adjustable shelf will accept cross arms from 7" - 12" high. Both wool contacting surfaces have integral teeth which grip the pole or dimension cross arm, take most of the load off the wood surrounding the through bolt hole, increase the transverse stability of the dimension arm and provide more efficient load transfer. No cut gain on the pole is necessary.

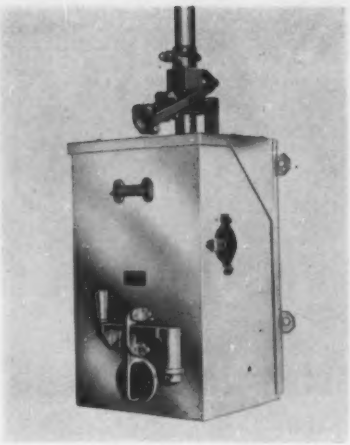
For butt connections in dimension timber there is the new MIF flat universal angle connector. The flat grid gain contacting surface provides maximum stability and facilitates framing. This connection is easy to install, requiring only a single bolt attachment for each member.

New MIF flat grid gains (shear plates) are designed similarly to regular field proved grid gains except that they are for use with dimension timber.

Write U-1102 on reply card, pg. 19

Powerful motor mechanism features easy accessibility

SOUTHERN STATES Equipment Corp., of Hampton, Ga., recently announced the availability of a new, powerful motor mechanism. The new mechanism, designated the Type VM, is available in torque ratings of 10,000 and 20,000 pound-inches. It is designed to provide power operation for any rating of air switch.



The VM develops its rated torque at approximately 70 per cent of rated voltage. A special high torque motor is available in 24, 48, 125, or 250 volts d-c and in 115 or 230 volts a-c.

One of the outstanding features of the VM is its accessibility. Removal of sheet aluminum cover permits inspection or maintenance on three sides.

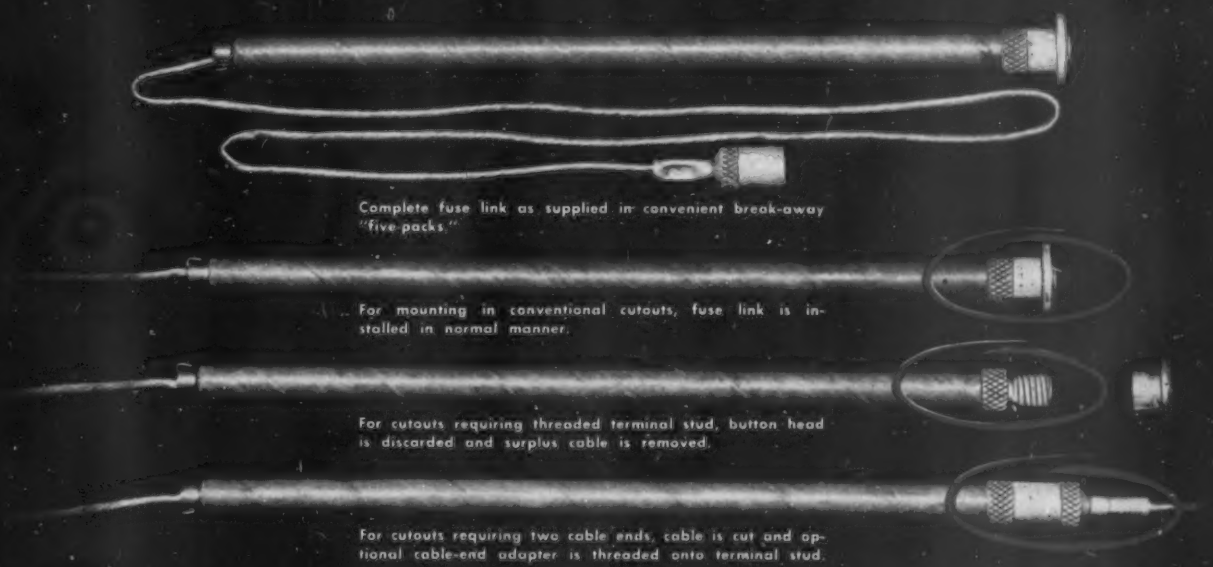
Write U-1103 on reply card, pg. 19

New conversion kits make testing units dual-purpose

A NEW hot-line conversion kit has been designed by the HD Electric Co., 760 Osterman, Deerfield, Ill. It will convert their standard Max-I-Meters already in the field to a convenient dual-purpose Max-I-Meter.

The company has announced the availability of the new kit for immediate shipment. The new conversion kit is specifically designed for the standard HD Max-I-Meters that are in use throughout the utility field. Conversion of a standard Max-I-Meter enables the operator to in-

interrupted quickly—effectively, by
General Electric universal fuse links


Complete fuse link as supplied in convenient break-away "five-packs."
For mounting in conventional cutouts, fuse link is installed in normal manner.
For cutouts requiring threaded terminal stud, button head is discarded and surplus cable is removed.
For cutouts requiring two cable ends, cable is cut and optional cable-end adapter is threaded onto terminal stud.

GENERAL ELECTRIC

stall the unit on either primary or secondary voltages. It is an inexpensive method for making these testing instruments dual-purpose. According to the company, the conversion is made within a matter of minutes. Only six easy steps are involved in adapting the instrument into a dual-purpose roll that will make it usable for testing or measuring amperage on primary voltages.

Write U-1104 on reply card, pg. 19

New connectors feature stainless steel clips

COMPRESSION series CPT, a new line of extruded aluminum parallel groove connectors, is announced for Anderson Electric Corp., 700 N. 44th St., Birmingham, Ala.

One outstanding feature of the new connectors is stainless steel clips. These snap on to the main conductor and hold the CPT in place while a tap is made. This provides faster,

safer installation and allows for "hot" as well as "cold" installation.

Shaped in a one-piece figure "6" design, CPT connectors are adaptable for either "L" or stirrup taps. The main groove is designed for full cable seating, and the solid barrier between conductors minimizes corrosion and cold flow. The connectors can be crimped with most standard tools and dies.

CPT connectors are available in sizes to cover cable ranges from #6 solid to 4/0 ACSR.

Write U-1105 on reply card, pg. 19

Transformer line reduced in height and weight

REDUCTIONS of as much as 20 to 30 per cent in height and weight of their line of standard small power transformers (5,000 kva and below, 69 kv and below) is announced by Allis-Chalmers Mfg. Co., 938 S. 70th St. The redesigned smaller, lighter line means lower foundation, structure, and landscaping costs, lower unloading and setting-in-place charges, and more flexibility for users.

All sizes have been computer pre-engineered to provide the best possible design. Inasmuch as engineering is complete, an order can be placed in the manufacturing schedule immediately upon receipt at the factory and, as a result, delivery times are short.

Other special features now available with the redesigned transformer line include: tank bottom sump for sediment collection and complete draining; tap charger at convenient level; grouped accessories; mechanical pressure relief device; base designed for pier mounting; unique easily removable handhole covers; drop over tank construction; and clean, smooth appearance (no external bracing).

Write U-1106 on reply card, pg. 19

Static wire stringing block available in two types

A NEW PRODUCT of Sherman & Reilly, Inc., First and Broad Sts., Chattanooga 2, Tenn., is a static wire stringing block. The sheave is drop forged steel with completely machined rope groove. The result is absolute concentricity between groove and bore.

Available in two types—No. 9311 has full strap with safety locking head pin; No. 9611 has modified strap construction with unique sheave pin cam lock.

Both types incorporate articulated swivel safety hook and widened throat for passage of pulling connections and sleeve splices.

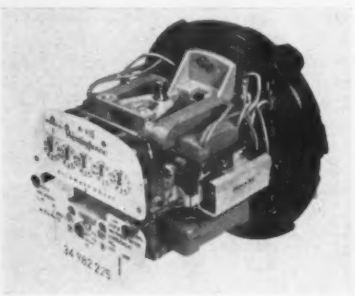
Blocks are offered in various sizes for all types of static wire through 5/8" in diameter.

Write U-1107 on reply card, pg. 19

Line of watt-hour meters includes improved designs

A NEW LINE of 120-, 240-, and 480-volt polyphase watt-hour meters announced by Westinghouse Electric Corporation, Meter Department, Raleigh, N. C., includes improved designs for all types previously available plus a universal meter for 120-, 240-, and 277-volt circuits. Developed for use with the universal meter package announced earlier by Westinghouse, the universal meter has a dual-rating voltage coil and a series-parallel switching device; it can be used on both 120- and 240-volt circuits without recalibration.

The new design contributes major advantages to all meters in the line. Resistance to corrosion is much in-



creased: the frames are protected by application of the same thermosetting epoxy ester enamel (Epodur) that Westinghouse is already using for single-phase meters; galvanic corrosion of the glass-cover rim has been virtually eliminated by making it from 18-8 stainless steel rather than aluminum; and corrosion of metal internal metal parts is prevented by use of new metal finishes and a compatible metal system for the register.

Write U-1108 on reply card, pg. 19

Series multiple switch provides choice of ratings

PENNSYLVANIA Transformer Division, McGraw-Edison Co., P. O. Box 330, Canonsburg, Pa., has announced the availability of an externally operated series-multiple switch on the company's "Pole Star" distribution transformers. This optional feature, which provides a choice of two high voltage ratings, is offered for transformers to be used on feeders

(Continued on page 104)

Generating equipment for public utilities or for industry

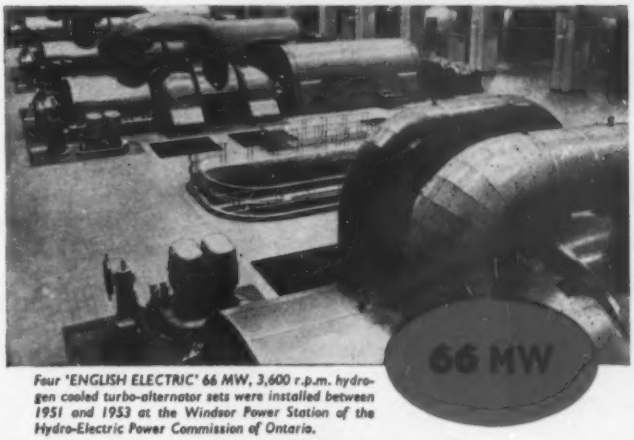
Artist's impression of one of two 275 MW 3,000 r.p.m. turbo-alternator sets operating at 2,300 p.s.i.g. 1050°F. with reheat 1050°F. being built by 'ENGLISH ELECTRIC' for the Central Electricity Generating Board of the United Kingdom. The alternators are direct hydrogen cooled.

One of four 'ENGLISH ELECTRIC' 100 MW 3,000 r.p.m. turbo-alternator sets installed in Willington Power Station, England. These hydrogen-cooled turbo-alternator sets operate with steam at 1500 p.s.i.g. 1,050°F.

'ENGLISH ELECTRIC' steam turbo-alternator sets and auxiliary equipment have been installed by public utilities and industry throughout the world.

Backed by over 55 years experience, 'ENGLISH ELECTRIC' are today manufacturing sets amongst the largest in the world, including two 275 MW units and five 200 MW units for the Central Electricity Generating Board of the United Kingdom as well as many small output industrial units.

'ENGLISH ELECTRIC' products cover all aspects of the generation, transmission and utilization of electric power. Contracts have been completed and others are in hand for many major American power projects.



Four 'ENGLISH ELECTRIC' 66 MW, 3,600 r.p.m. hydrogen cooled turbo-alternator sets were installed between 1951 and 1953 at the Windsor Power Station of the Hydro-Electric Power Commission of Ontario.

'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Telephone: MURRAY HILL 7-0303

Sub Agents:—

James I. Metcalf & Co. Inc., 701 United Pacific Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix, for Alaska, Arizona, California, Idaho, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.

Osgood & Associates, Inc., 988 Spring St., N.W., P.O. Box 7383, Station C, Atlanta 9, Ga. for Alabama, Florida, Georgia, Kentucky, South Carolina and Tennessee.

Electron Equipment Co. Inc., 1050 Constance St., New Orleans, 13, La. for Louisiana and Mississippi.

Peabody Bros., 2903 St. Louis St.at Oakland, Dallas. 26 Texas. Branch offices in Houston and Tulsa, for Arkansas, New Mexico, Oklahoma and Texas.

SERVICE FACILITIES ARE AVAILABLE THROUGH THREE LARGE CANADIAN PLANTS

OC/US/4

150,000

90,000

135,000

217,000

300,000

125,000

160,000

96,000

75,000

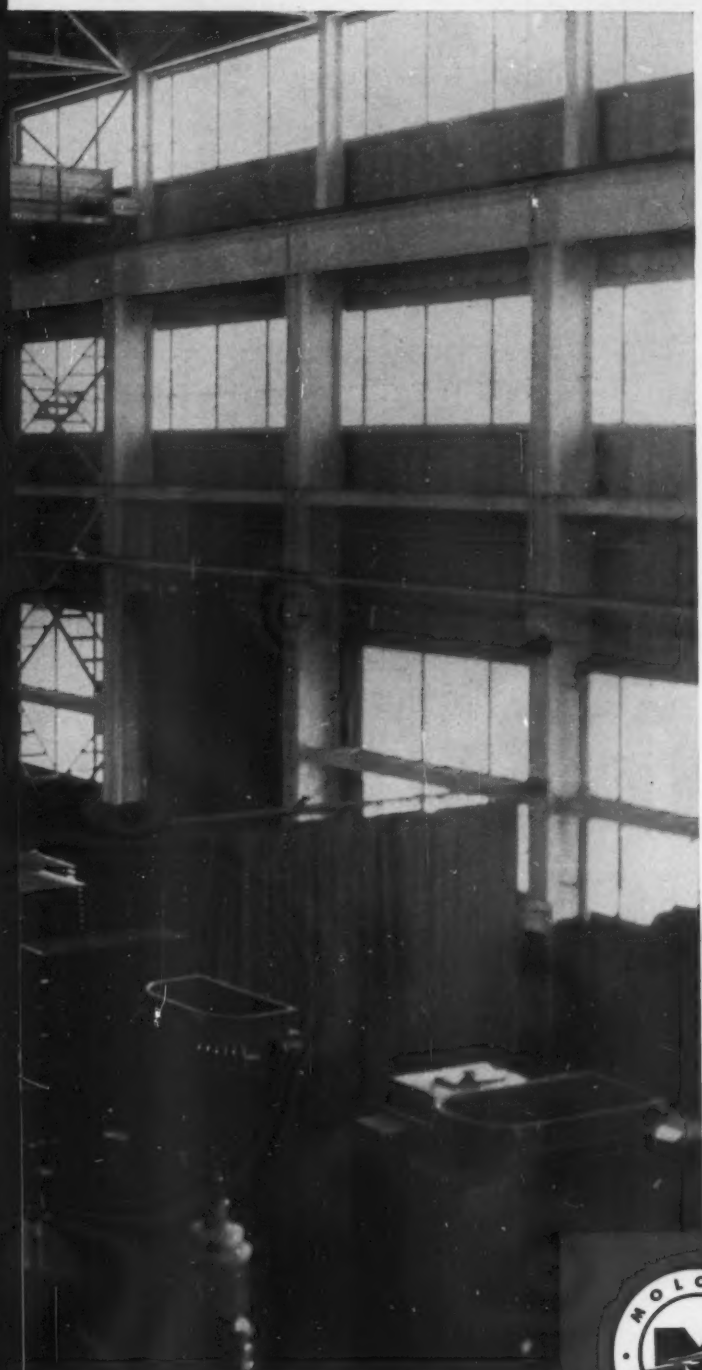
200,000

100,000

230,000

Transformers for

—THE NUMBER YOU PICK . . .



depends on carefully calculated system requirements of present and future loads. So too, must the manufacturer of power transformers be chosen, carefully . . . and with an eye to the future.

To this end, careful consideration of Moloney Electric Company's qualifications will reveal these facts:

- Sixty-three years experience in designing transformers of all types and sizes.
- Modern, extensive facilities with the capacity to produce transformers of any size or rating.
- Unexcelled product operating records.
- Continuous research and development to improve transformer design and manufacture.

This ability to design and manufacture efficient, dependable transformers of any rating is a carefully calculated result of Moloney planning and preparation.

When "the number you pick" is determined, be sure that your requirements are adequately fulfilled, specify Moloney Transformers . . . All Along The Line.

M2X6-8

MOLONEY ELECTRIC

FACTORIES
ST. LOUIS 20, MISSOURI
TORONTO, ONT., CAN.

SALES OFFICES
IN ALL PRINCIPAL CITIES

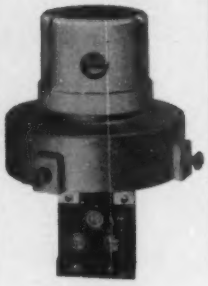
Utilities, Industry, and Electronic Applications

Luminaire or slipfitter mounting, bases up to 3" diam. . . . Model 6600A. (For bases up to 3½" diam, . . . Model 6607A)

Pole or crossarm mounting . . . Model 6601A

Replacement plug-in for F-P Model S-64400 . . . Model 6604A. (Also, Model 6603A replacement for F-P Model S-64400GE.)

Ornamental pole top mounting . . . Model 6600A with S-485 adapter (adapter also available for poles with I. D. less than 3")



Bracket mounting . . . Model 6600A with S-487 clamp assembly.

FISHER-PIERCE 6600A PHOTOELECTRIC CONTROLS

no mounting problems here...

You can put Fisher-Pierce 6600A Series controls *into* service quickly, easily and safely in almost any location – and they'll *stay* in service for years of maintenance-free operation. *Directional operation* and *delayed circuit response* provide uniform turn-on, protection against accidental turn-off; *built-in expulsion-type arrestor* protects control against surges and lightning; *broad area hermetically sealed CdS cell* is pre-aged and 100% inspected against rigid specifications; *circuit design conservatively derates* all components; *twistlock plug, base dimensions and sealing means* conform to EEI-NEMA standard for twistlock adaptations; all Series 6600A controls are *unconditionally guaranteed for two years.*

For complete descriptive details, write for the 8-page Detailed Technical Bulletin, no. FP-830. The Fisher-Pierce Co., 59 *Pearl St., So. Braintree 85, Mass.*

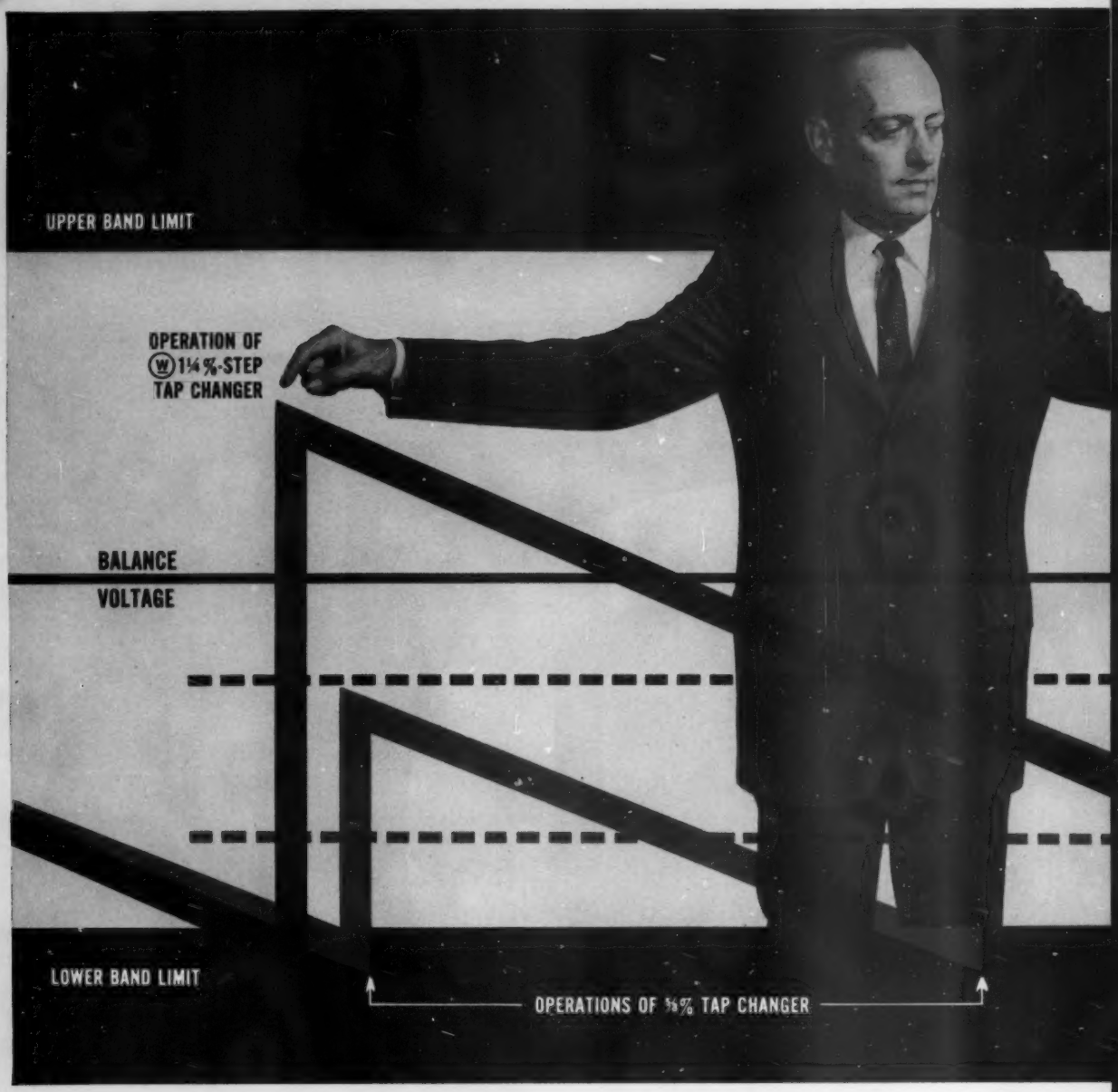
FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Type OV-25
with built-in ballast
WESTINGHOUSE
Type OV-10
Model 6600A
Actual Size
WHEELER
Crescent Luminaire
JOSLYN
Model J152278C

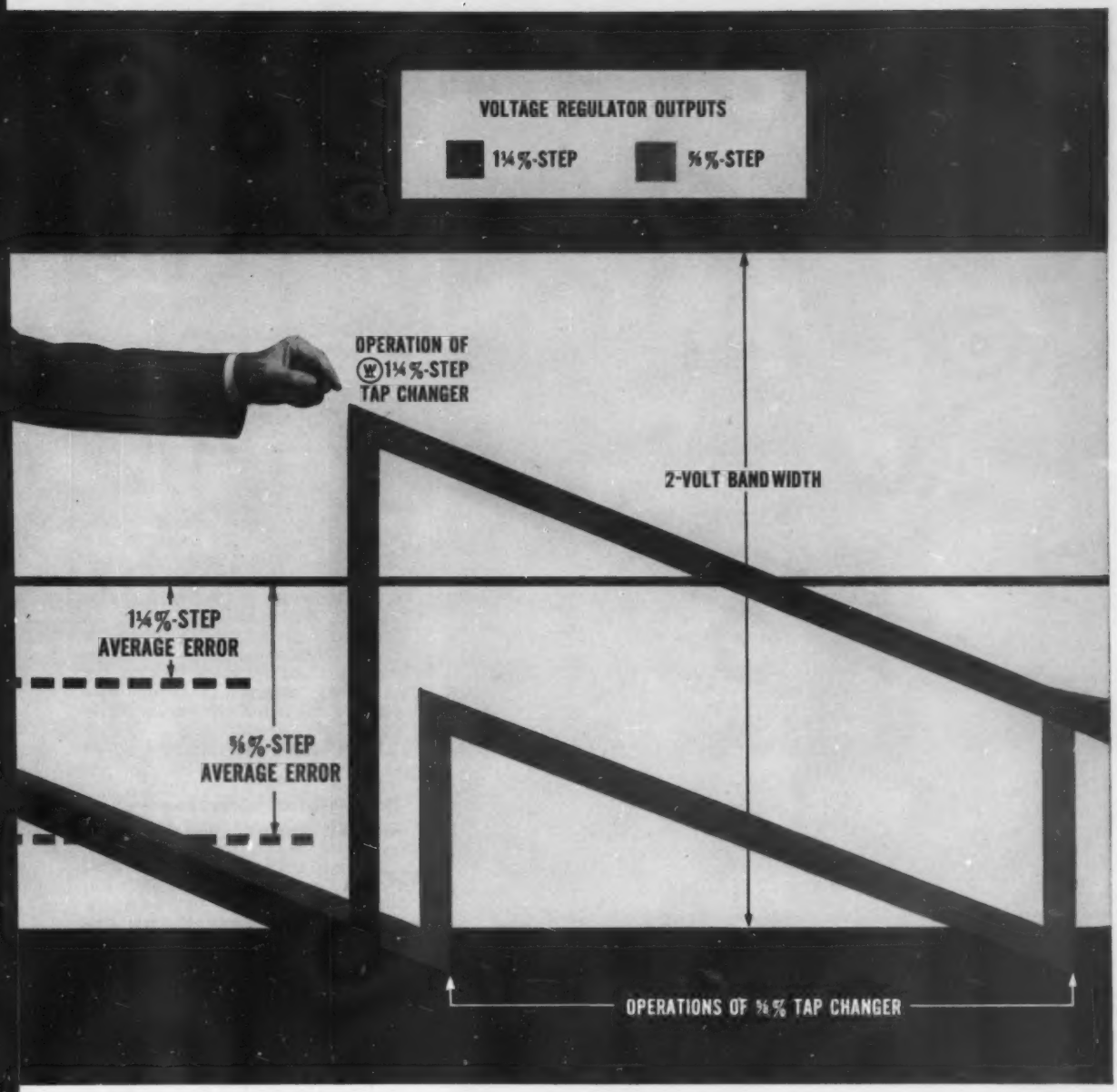


Here's how Westinghouse 1¼%-step regulation provides

Tap changer operations are the key to good system voltage control since no regulating is done until the tap changer operates. For best results, tap changes should be correctly timed and reasonable in number.

With ordinary control schemes, voltage relay bandwidths are often set in such a manner that it becomes necessary to effectively widen the band by adding fixed time delay to prevent an unreasonable number of tap changer operations. Where this is done, regulator output voltage bandwidth may vary widely, depending on the rate and extent of variation of input voltage. But with Westinghouse URL and URF regulators, you set the bandwidth you want and the unique CVR inverse time voltage relay, combined with instant response tap changer, prevents sustained wide voltage variations which are possible with fixed time delay. The result . . . a narrower effective band in the actual output where it counts. As an added benefit, the larger step gives an average voltage closer to midband, as shown in the illustration above.

You can protect your customers against abrupt voltage changes, get narrower effective bandwidths, and achieve better average levels when you use



closer voltage control...with fewer operations

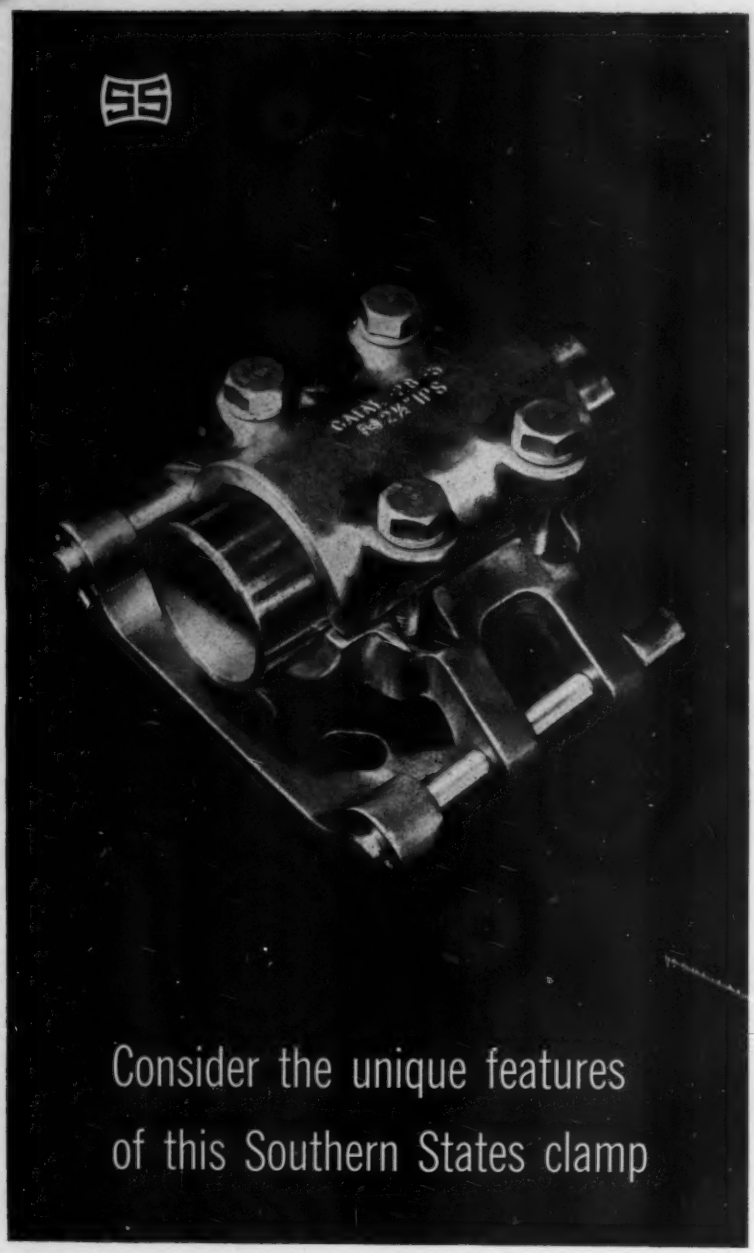
Westinghouse 1¼ %-step regulators; and you get longer life with reduced maintenance because fewer operations are required.

Ask your Westinghouse sales engineer for further details about the bonus values from Westinghouse 1¼ %-step voltage regulators. J-70902

YOU CAN BE SURE...IF IT'S

Westinghouse

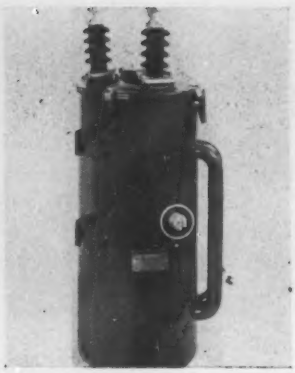
WATCH WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS CBS TV FRIDAYS



This exclusive design offers many advantages in a sliding bus support clamp: two stainless steel excursion rods... wide support to provide high cantilever strength... movement in only one direction — no pivoting or side chatter... heat-treated, high strength aluminum... anodized bolts. The Type CAIAL is another example of Southern States engineering.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto



that are expected to be raised to a higher voltage at some future date.

Advantages include the relative ease with which the conversion to a higher voltage can be made, as well as elimination of the cost of changing transformers.

The dual voltage ratings include 2400 x 7200, 2400 x 7620, 4800 x 7620, and 4800 x 14,400 volts, with secondary ratings of 120/240 volts. Capacities range from 5 through 100 kva.

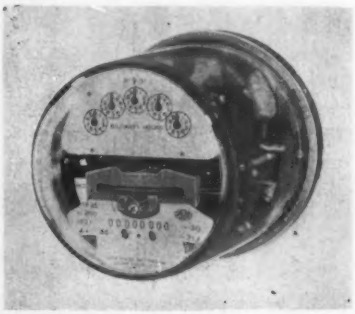
According to the Pennsylvania Transformer announcement, no special tools are required to turn the externally operated series-multiple switch. The cap of the switch serves as the only necessary tool.

Write U-1109 on reply card, pg. 19

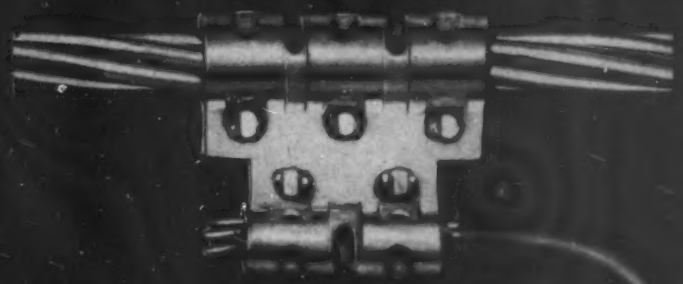
Three stator meter has full 200 ampere capacity

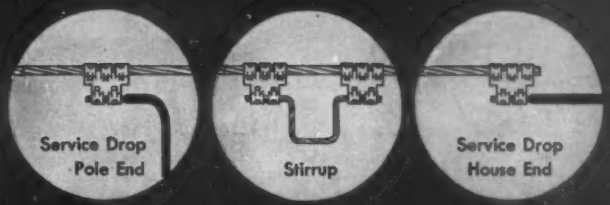
A THREE STATOR meter, designated P-3, in round construction with full 200 ampere capacity has been announced by Sangamo Electric Co., Springfield, Ill. Availability of this three stator meter for measurement of four wire wye services completes the line of P polyphase meters which Sangamo has introduced during the past year.

A 5% reduction in price has been made simultaneously with the introduction of the P-3, and applies to the Class 100 and Class 10 ratings as well as to the Class 200. This results in a cost reduction of 85 cents/kva of meter capacity.



The TAP that TOPS them all...





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Light-weight matched tooling available in mechanical or hydraulic types.

The only tap on the market that converts from an easily attached open barrel construction to a permanent, closed barrel attachment.

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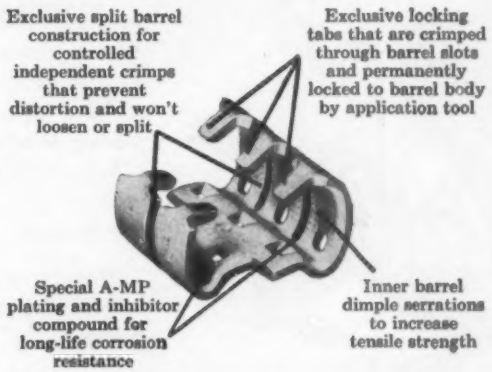
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Full range of wire size combinations for aluminum, copper or ACSR conductors.

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As the only American paints made with *lead-suboxide,* Subox paints provide extraordinary protection to metal surfaces. Unlike inert pigments, *lead-suboxide* is chemically active. That means Subox works continuously to combat corrosion.

Two coats of Subox usually will give the protection of three of standard paint, and frequently but one coat is enough.

Even under severe conditions, Subox paints do not crack, chip or blister. Eventual repainting costs are cut to a minimum because *lead-suboxide* establishes a dense, metallic lead film which can be recoated without expensive scraping, sanding or repriming.

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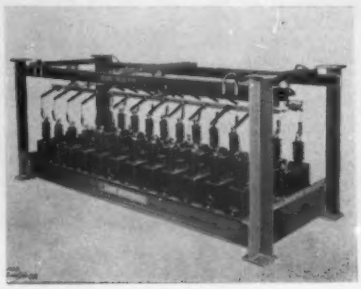
The P-3 has sectionalized construction and is easily calibrated. Its single disk, round design cuts both weight and volume by 50% as compared to bathtub-type three stator meters. It is furnished in both socket mounting and bottom connected models.

Write U-1110 on reply card, pg. 19

Aluminum capacitor blocks available for 25-kvar units

FACTORY-ASSEMBLED capacitor blocks, being offered by Line Material Industries, 700 W. Michigan, Milwaukee 1, Wis., have been designed for use with 25-kvar units in open type banks at transmission, subtransmission, and distribution voltages. A standard block consists of two rows of 25-kvar capacitor units, 5-kv or



8.7-kv class, connected in parallel and mounted in a welded aluminum frame of standardized dimensions.

Available blocks have capacities of 250 kvar through 700 kvar in increments of 50 kvar. Individual fuses in bus-mounted cutouts protect the units. A complete line of accessories is available, including base support insulators.

These blocks reduce field installation charges because of light weight per kvar. They facilitate changes in bank size and voltage rating as varying system conditions require. They also provide flexibility for relocation.

Write U-1111 on reply card, pg. 19

New automatic deadend is corrosion resistant

FARGO MFG. CO., INC., 845 Main St., Poughkeepsie, N. Y., announces a new automatic deadend for all standard sizes of "Alumoweld", aluminum clad steel messenger, static wire, or guy strand.

The "GDEA Series" maintains 95 per cent or better of the strength of Alumoweld with extra-long aluminum jaws. The exclusive one-piece Fargo jaws are of high strength aluminum alloy and are designed to hold on the aluminum coating of the conductor and not puncture through to the steel.

Write U-1112 on reply card, pg. 19

Know the law

by Arthur L. H. Street

Lighting and wiring installation lienable

A CONTRACTOR installed an electric wiring system in a building in conduits partly within walls, with conduits attached to walls by metal strips and screws, where possible. Flourescent lighting fixtures were attached to the ceiling and outlets were attached both in the walls and in the floor. Did the system become a part of the real estate in such sense as to permit enforcement of a mechanic's lien against the property?

Yes, decided the Appellate Court of Illinois, Third District, in the case of Babiak, Jr. v. Strum, 155 N.E. 2d 332. The court rejected argument that the system constituted a removable "trade fixture", and was therefore removable chattel property.

Lessee bound owner for electrical work

PLAINTIFF, an electrical contractor, sued the owners of property and their lessee who used the premises for business purposes, alleging that the owners ordered certain electrical installations to be made, and that the lessee ordered installation of additional equipment. Plaintiff further alleged that he believed that the lessee acted as agent in ordering installation of the equipment.

Did the trial judge err in allowing personal judgment against the lessee?

The Wyoming Supreme Court gave a yes answer to this question, in the case of Thomas v. Gonzelas, 331 Pac. 2d 832. The Supreme Court, in ordering a new trial, said:

"The amended petition is ambiguous. It fails to state a clear cause of action against Emett Thomas (the lessee). It is therein alleged that Emett Thomas acted as agent for the Cheevers (the owners) in ordering electrical equipment, impliedly asserting that he did so within the scope of his authority. It is stated in 2 Restatement, Agency, Section 328, p.724: 'An agent, by making a contract only on behalf of a competent disclosed or partially disclosed principal whom he has power to so bind, does not thereby become liable for its nonperformance.' In the comment to that section it is said:

" 'One who makes a contract only on account of another ordinarily does not himself contemplate responsibility for its performance. His function is performed if he causes a contract to be made between his principal and the third person. ***' "

"In 3 C.J.S. Agency, Section 215, p. 119, it is stated:

" 'An agent who contracts on behalf of a disclosed principal and within the scope of his authority, in the absence of an agreement otherwise, or other circumstances showing that he has expressly or impliedly incurred or intended to incur personal responsibility, is not personally liable to the other contracting party * * *' There is no allegation in the second amended petition which discloses that the appellant Emett Thomas intended to bind himself personally."

Crediting payments on two or more accounts

◆ ELECTRICAL contractors and dealers in electrical supplies should be fully informed as to the rights of creditors and debtors concerning the crediting of payments made by a debtor where he owes the creditor on two or more separate accounts or separable items of a general account.

For example, there may be a general running account covering materials supplied to the debtor for general use and also charges covering materials supplied for a special job or jobs. Such was the situation in a case very lately decided by the Minnesota Supreme Court. The decision is in line with what any court in any state might decide. (General Electric Co. v. Anchor Casualty Co., 87 N.W. 2d 639.)

Plaintiff had, from time to time furnished an electrical contracting company supplies for special use on various jobs as well as supplies for general use. Defendant was surety for the contractor on two bonds securing payment for materials used on two separate school building jobs. Plaintiff successfully sued the surety company for about $59,000 covering such materials.

The surety unsuccessfully defended on the ground that after having first credited to general account payments made by the electrical contractor, without designating what accounts should be credited, the plaintiff later, without objection by the contractor, credited payments partly to open account and partly to 12 specific job accounts, including the two jobs covered by defendant's bonds. Plaintiff admitted the final crediting was done to separate accounts for supplies, payment for which was secured by bonds from accounts not so secured.

The surety company virtually conceded that, as a third party, it would have no right to challenge an original credit to a particular account or accounts of a payment made by the debtor to the creditor. This would be so whether payment was so credited by direction of the debtor or by the creditor on the debtor failing to direct how the payment should be credited. So the surety company did not claim that it had any right to object to how the payments were originally credited. But it did contend—unsuccessfully—that it had a right to object to the plaintiff's delay in selecting items of the general account to be credited.

The following summary of the court's decision broadly covers the law of crediting of payments on all sorts of special or running accounts:

Generally, the debtor who makes a payment has a right to require the creditor to credit it to one of two or more separate debts. Acceptance of the payment leaves the creditor no choice but to so apply the payment. "If the debtor makes no direction the creditor may, *within a reasonable time*, apply it as best suits his interest."

The surety company argued that because payments received by the

(Continued on page 134)

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ HAVING LISTED and reviewed in the October issue the principal changes occurring in the 1959 Code, we will discuss in more detail for a better understanding some of the more important of these changes in this and the next issue of this magazine.

New definitions

Of the definitions added, two are re-insertions from earlier Codes after having been deleted from more recent issues, and eight are entirely new with this Code. Another definition has been modified by a change in the fine print note.

The two which were omitted from the 1956 Code and reinserted in the 1959 issue are *feeder* and *portable appliance*. *Feeder* was omitted accidentally, but *portable appliance* was intentionally left out of the 1956 Code. Its reinsertion in the 1959 Code is a stop-gap measure permitting this definition to be used until further study of the terms *stationary*, *fixed*, and *portable* result in definitions which should more accurately describe the nature and functions of various types of appliances in relation to the wiring method and disconnecting means needed for each type.

For instance, as it stands now, receptacles and attachment caps are acceptable for use as disconnecting means for some appliances but not for others. For some, receptacles are permitted to be used for convenience in servicing only, provided that other approved disconnecting means are also provided.

Code test questions

(These questions are based on the new 1959 edition of the National Electrical Code.)

1. An auxiliary gutter is a raceway. True or false?

2. An a-c/d-c general-use snap switch is suitable for controlling an a-c inductive load only if such a load does not exceed one half of the ampere rating of the switch at its rated voltage. True or false?

3. An a-c general-use snap switch is suitable for controlling an a-c inductive or resistive load up to and including the full ampere rating of the switch at its rated voltage. True or false?

4. Fluorescent lighting operating at a nominal 277 volts supplied by a 480/277 volt system is not permitted to be installed in hotel lobbies or in other public areas in hotels. True or false?

5. Tap conductors supplying electric ranges and cooking units may extend from the first floor to a junction box in the basement provided that the distance does not exceed 10 feet. True or false?

6. A current-limiting overcurrent protective device is a device:

(a) which limits the flow of current in normal use to an amount not exceeding a predetermined current setting.

(b) which limits the flow of current in the circuit in the event of a fault or short-circuit by shunting the excess current out of the circuit conductors and dissipating it in the form of heat.

(c) which, when interrupting a specified circuit, will consistently limit the short-circuit current in that circuit to a specified magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.

Which is correct? a? b? or c?

7. Where an outlet is installed at a kitchen sink location in a dwelling, it shall be:

(a) of the T-slotted type.

(b) of the grounding type.

(c) of the split-receptacle type.

Which is correct? a? b? or c?

8. In the principal cooking, eating, living, and sleeping areas of a residence, a receptacle shall be installed:

(a) so that no point along the floor line of any usable wall space is more than six feet from an outlet.

(b) for each 12 feet or major fraction thereof of the total distance measured horizontally around the room.

(c) so that no point along the floor line of any usable wall space is more than 12 feet from an outlet.

Which is correct? a? b? or c?

9. For the small appliance load in a dwelling serving the kitchen, dining-room, breakfast room, pantry, and laundry:

(a) one or more 20-ampere branch circuits shall be installed for receptacle outlets.

(b) two or more 20-ampere branch circuits shall be provided for receptacle outlets.

(c) two or more 15- or 20-ampere branch circuits shall be provided for receptacle outlets.

Which is correct? a? b? or c?

10. In computing the neutral feeder load, there shall be no reduction in the neutral capacity:

(a) for the portion of the load which consists of electric discharge lighting.

(b) where the load consists of 50 per cent or more of electric discharge lighting.

(c) where any part of the load consists of electric discharge lighting.

Which is correct? a? b? or c?

(Correct answers will be found at end of article on page 133.)

Portable vs. fixed

As an example, a free-standing range is certainly not portable in the same sense as that term is applied to an electric drill or to a vacuum cleaner, because it is not moved about from place to place in normal use.

On the other hand, it is not stationary in the same sense as this word is applied to a built-in appliance, such as a wall-mounted oven or a counter-mounted cooking unit. Such a free-standing range could (and probably will) be defined as a *fixed* appliance. This definition could also apply to a window-mounted air-conditioner, but not to a similar air-conditioner which is built into a wall.

An appliance which is similar to one which in free-standing but which leans slightly more to the stationary is a garbage disposal unit. Another appliance which is similar to the free-standing unit but which leans rather more toward the portable is the electric roaster. This appliance is usually on casters and can be plugged in anywhere; but its load factor is sufficiently great to justify a separate circuit which, in effect, limits its use to a designated area.

For awhile, then, the local inspection authority will be called upon to rule on whether an appliance is portable by the terms of this definition of *portable* as reinstated into the 1959 Code. Fortunately, he will have specific Code rules to guide him in respect to some of these appliances, such as ranges and built-in cooking units in Article 422.

Most inspectors, however, as well as contractors, will welcome a more comprehensive set of definitions to cover all types of appliances, as well as specific Code rules governing each type.

Gutters not raceways

The definition which has been modified is *raceway*. By the change in the fine print note, it is to be presumed that gutters are no longer to be considered as raceways. Auxiliary gutters have always been considered by electricians more as accessories to switch gear than as raceways.

However, they were included as examples of raceways in the 1956 Code definition of raceway. Therefore, it is only by this deletion that we are to know of this change in status, for the same fine print note from which the deletion was made does not name *all* of the raceway types.

For instance, it does not name cellular concrete floor raceways, although this type of floor duct is recognized elsewhere in the Code as a raceway. Hence, it is not its *absence* from the fine print note that indicates it is not a raceway, but the *act of deletion* from among the listed examples which indicates this. By this intentional overt act of deletion, then, we now know that auxiliary gutters are no longer meant to be considered as raceways.

The number of conductors permitted in auxiliary gutters has not been changed as it has for raceways. But neither has the rule been changed for the conductor-fill in wireways. Wireway and auxiliary gutter rules are the same regarding the number of conductors and the amount of cross-sectional fill. (Sections 362-5 and 374-5). Wireways, however, are still considered to be raceways.

The eight new definitions are: automatic, non-automatic, counter-mounted cooking unit, wall-mounted oven, current-limiting overcurrent protective device, general-use snap switch, a-c general-use snap switch, and a-c/d-c general-use snap switch.

Switches defined

The word *snap* was utilized here in combination with the term *general-use* to more accurately define these switches and at the same time to distinguish them from the switches already known and defined as *general-use*.

Of these three types of snap switches, two have been in use for many years—the general-use snap switch and the a-c/d-c general-use snap switch. The a-c general-use snap switch, however, is a comparatively recent device which was primarily designed for a-c inductive loads, such as electric discharge outline lighting and fluorescent fixtures.

Later, it was approved for 277-volt fluorescent lighting. And now it is permitted for the uses outlined in the new definition. It differs from the other snap switches, such as the a-c/d-c, in that it will carry safely for long periods of time on a-c only its full current rating at rated voltage, except for motor loads which are restricted to 80 per cent of its full rating.

The *counter-mounted cooking unit* and the *wall-mounted oven* are, of course, the now familiar built-in "range top" and "oven" sometimes referred to as "range components." The defined words *automatic* and *non-automatic* need no explanations.

The term *current-limiting overcurrent protective device* is listed in Article 100—Definitions, but this listing only refers to Section 240-27 where the actual definition is made. This is the device which is becoming more prevalent and more necessary on systems where short-circuit and ground fault currents are of such magnitudes as to be unsafe to interrupt by means of conventional interrupting devices.

Section 210-6, Exception No. 2, now permits 277-volt lighting in public and commercial areas of any type building. This type lighting formerly was limited to industrial establishments, office buildings, schools, and stores.

Section 210-19, Exception No. 2(d), clarifies the Code intention of a reduction of conductor size for taps to ranges, ovens, and cooking units. This exception indicates clearly that such taps include *only* the range or cooking unit *connection conductors*, or "pig tails." It does *not* include taps originating at some distant junction box in the circuit wiring.

Grounding receptacles

Section 210-21 (b) has eliminated the 20-ampere receptacle on 30-ampere circuits, leaving only the 30-ampere receptacle as being permissible on such circuits. Grounding type receptacles are now clearly required by the non-interchangeable requirements in this section to be of the new grounding types with parallel blades for 120 volts and with tandem blades for 240, eliminating the crow's foot type receptacles for grounding use on 15- and 20-ampere 120-volt circuits and on 15-ampere 240-volt circuits.

Section 210-22 (Receptacle Outlets Required) has made two definite improvements and, in my opinion, one change for the worse. The first improvement is in the wording requiring that no point along the floor line in any usable wall space be more than six feet from an outlet. The term *usable wall space* is clearly defined as being "any wall space two feet wide or greater" including "the wall space occupied by sliding panels in exterior walls." This clearly eliminates sliding panels on *interior* clothes closet walls as

well as the narrow wall space separating two such sliding closet panels where receptacles are of no possible use.

It also eliminates counting the non-existent "wall" between an eating area and a living area when these areas have not been partitioned. This will save the inspector no end of embarrassment such as he was formerly subjected to when confronted with the number of receptacles formerly required by a strict literal interpretation of the old Code. (See Figures 1 and 2).

The new wording is perfect in that it does require a receptacle at each point where it would be needed regardless of how the furniture might be arranged and without the need of cords being longer than the standard six feet. At the same time the rule is not inconsistent with the Code Introduction, Section 90-1 (b), which states, in part, "This Code contains basic minimum provisions considered necessary for safety . . ."

The second improvement mentioned above is in the clarified and additional requirements for grounding type outlets in dwellings. There may be some question as to what areas are included in the term "at the sink location." However, other Code requirements have established the rule that an area within 5 feet horizontally and 8 feet vertically of an object is within reach. Anything within reach of the sink, then, must be assumed to be "at the sink location." Despite this minor possibility of a misunderstanding, however, there is no question that grounding requirements for receptacles in dwellings has been definitely improved and clarified.

So much for the improvements of this section. Now for the change which I, at least, consider unwelcome:

Outlets in laundry rooms

One sentence was eliminated from Section 210-22 of the 1959 Code which has been in the Code for years, and which, in my opinion, should have been left in. In fact, it should have been strengthened. But it was deleted. The sentence which has been omitted did read, "At least one receptacle of the grounding type shall be installed for the connection of laundry appliances."

The new statement which should have been in addition to the old, but which has, instead, been substituted for the old, now reads as follows: "Only grounding type outlets shall be installed in laundry rooms." This statement can be taken to mean only one thing—if any outlets are to be installed in the laundry room, or in other areas for laundry appliances, they must be of the grounding type.

But there is no provision requiring that any be installed. There is a requirement that outlets be installed in every "kitchen, dining-room, breakfast room, living room, parlor, library, den, sun room, recreation room and bedroom." But none are required in a laundry room. The small appliance *circuits* required by Section 220-3 (b) for small appliance loads includes the "load" in the laundry as well as in the kitchen, pantry, dining-room, and breakfast room.

But Section 210-22 should also require an *outlet* for this load, as it formerly did. The only requirement which can be used for this purpose now is in paragraph (a) of this Section which requires receptacle outlets at all locations "where portable cords are used, except where the attachment of cords by other means is specifically permitted."

Washing machine circuit

Not only should an outlet be required, but a separate circuit should also be required for clothes washers. The average automatic washing machine of today has a running current of 7 amperes with a definite increase up to as high as 20 amperes on the spin sequence.

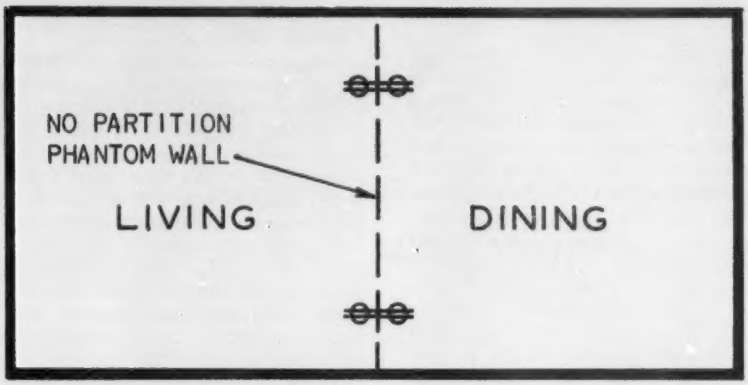


Fig. 1—This non-existent "phantom wall" between non-partitioned living and dining areas often caused confusion in determining the number of required outlets. Inspectors often "counted" the receptacles along this phantom wall and then added this number to those otherwise required in these rooms. This resulted in outlets closer than 12 feet on actual walls. The 1959 Code eliminates this confusion by requiring that no point along any usable wall space be greater than 6 feet from an outlet.

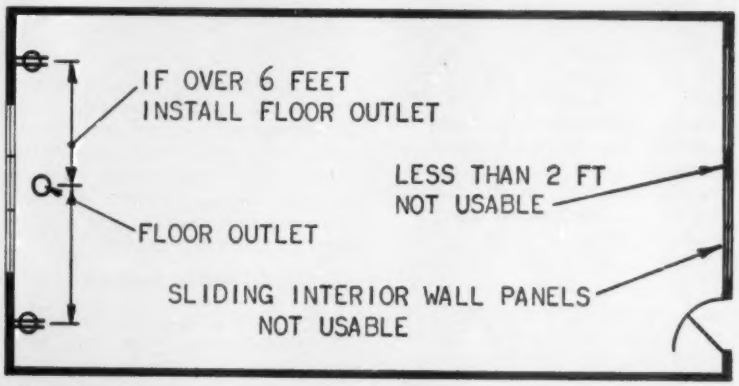


Fig. 2—Sliding exterior wall panels are required to be counted as usable wall space. Hence, if the placement of outlets on each side of such panels results in any point along such space being greater than 6 feet from an outlet, then a floor outlet near the wall is required.

An inspector can require a separate circuit for such machines by the provisions of Sections 422-2 and 430-53 (a) which require a separate circuit for motor operated appliances exceeding 6 amperes. But if the laundry machine has not been installed at the time of inspection, he is foiled from this approach, to the later sorrow of the occupant.

It would be much better, therefore, if Section 210-22 required a grounding type outlet for clothes washers, and if Section 220-3 required a separate 20-ampere circuit for this machine. The need for this is real and definite. As an inspector, I receive a great many complaints about clothes washers "kicking off" the small appliance circuit while the housewife is trying to cook at the same time that her washer is in operation.

Of course, the new requirement of Section 220-3 (b) that *two* small appliance circuits be provided where only one was required before will tend to alleviate this condition to a certain extent, but it will not entirely relieve it by any means. Many homes already have more than one small appliance circuit. But these also have trouble with washers which are not on separate circuits.

Table 210-25 now lists new types of insulation (as do other tables in the 1959 Code) such as Types SA and THW. Type THW serves the same purpose for thermoplastic insulations as Type RHW serves for rubber. Type SA (silicone asbestos) is silicone combined with rubber and with either asbestos or glass covering. It is suitable for use in dry locations at a maximum temperature of 90 C; except for special uses where 125 C is permissible. This compares with Type RHH rubber insulation.

Load calculations

The old table in section 2203-a of the 1956 Code has been separated into two tables in the 1959 Code—Tables 220-2 (a) and 220-4 (a). The first of these tables shows the minimum watts per square foot permitted for various types of occupancies, and the second shows the demand factors permitted in some of these occupancies.

The minimum watts per square foot has been increased from 3 to 5 in office buildings, and the demand factor is now a straight 100 per cent in office buildings. The demand factor for such buildings was formerly 100 per cent only for the first 30,000 square feet and 70 per cent for all over that.

Since most office buildings use all connected lighting at the same time during the entire working day, this demand factor was justifiably increased to 100 per cent for the total connected load. The increase from 3 to 5 watts per square foot for such buildings was also justified, since any amount less than this is likely to be increased after occupancy, resulting in overloads on the feeders and service as well as in the introduction of hazardous additions to the branch circuit wiring and fixture installations in many cases.

A change has been made in the neutral feeder size in Section 220-4 (d). This section now prohibits a reduction in neutral feeder size when supplying electric discharge lighting only to that portion of the load which consists of such electric discharge lighting. Formerly, if as much as 50 per cent of the load consisted of this type lighting, no reduction was permitted on any part of the neutral feeder load. (This does not alter the basic requirement for the neutral to be full size up to the first 200 amperes. This 200 amperes plus 70 per cent of that part in excess of 200 determines the neutral size. But where electric discharge lighting is supplied, the demand factor cannot be applied to this part of the load). (See Figure 3).

Section 220-4 (j) permits a 75

(Continued on page 132)

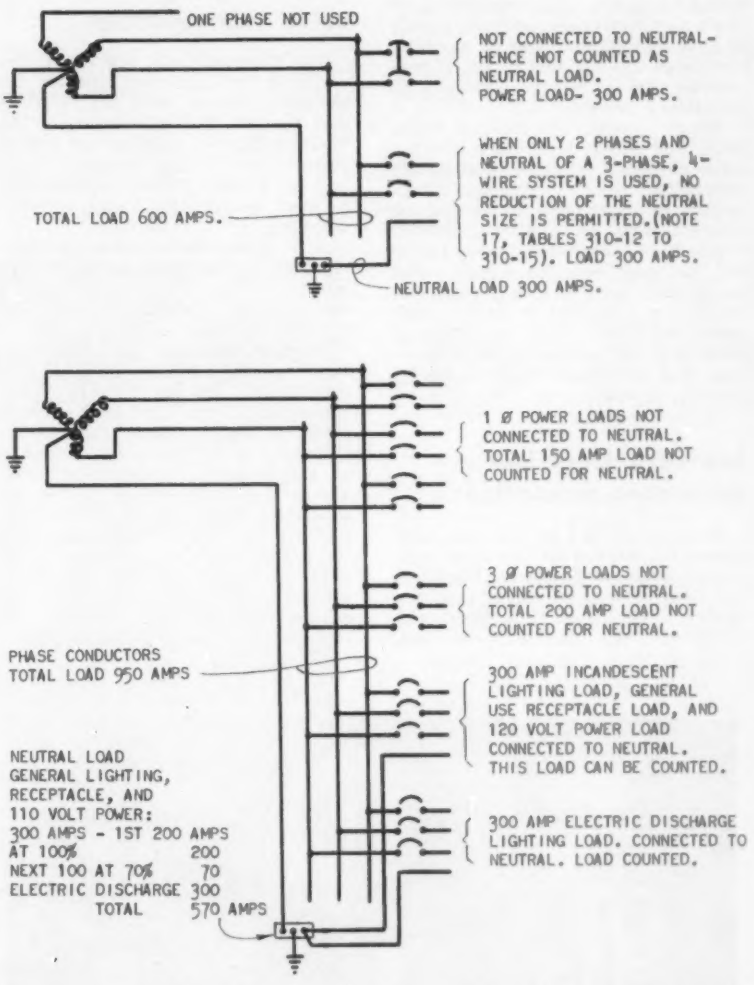

ONE PHASE NOT USED
NOT CONNECTED TO NEUTRAL-HENCE NOT COUNTED AS NEUTRAL LOAD. POWER LOAD- 300 AMPS.
WHEN ONLY 2 PHASES AND NEUTRAL OF A 3-PHASE, 4-WIRE SYSTEM IS USED, NO REDUCTION OF THE NEUTRAL SIZE IS PERMITTED.(NOTE 17, TABLES 310-12 TO 310-15). LOAD 300 AMPS.
TOTAL LOAD 600 AMPS.
NEUTRAL LOAD 300 AMPS.
1 Ø POWER LOADS NOT CONNECTED TO NEUTRAL. TOTAL 150 AMP LOAD NOT COUNTED FOR NEUTRAL.
3 Ø POWER LOADS NOT CONNECTED TO NEUTRAL. TOTAL 200 AMP LOAD NOT COUNTED FOR NEUTRAL.
PHASE CONDUCTORS TOTAL LOAD 950 AMPS
300 AMP INCANDESCENT LIGHTING LOAD, GENERAL USE RECEPTACLE LOAD, AND 120 VOLT POWER LOAD CONNECTED TO NEUTRAL. THIS LOAD CAN BE COUNTED.
NEUTRAL LOAD
GENERAL LIGHTING, RECEPTACLE, AND 110 VOLT POWER:
300 AMPS - 1ST 200 AMPS
AT 100% 200
NEXT 100 AT 70% 70
ELECTRIC DISCHARGE 300
TOTAL 570 AMPS
300 AMP ELECTRIC DISCHARGE LIGHTING LOAD. CONNECTED TO NEUTRAL. LOAD COUNTED.

Fig. 3—These notes point up the rules for determining neutral feeder size. Delta connected and single-phase loads are computed in the same way as the three-phase, four-wire wye system.

News of the industry

edited for Southern readers

Growth prospects good for electric utilities

"No OTHER major industry in America has growth prospects for the next decade which are more clearly defined than those of the electric power companies," *The Value Line Investment Survey* states. They provide an essential service of modern life, the demand for which expands regularly, even in years of business recession.

Per capita use of power, the Value Line Survey continues, is increasing steadily, compounding the growth in consumption. The companies distributing power have monopolies in their own territories. Growth in sales is as automatic for them as anything can be in the business world. A reasonable rate of return is assured by regulatory process.

Utility shares, the Survey notes, with their strong defensive attributes, have a special appeal in a generally overpriced market, although likely to remain under pressure from rising interest rates for a time. But *The Value Line Investment Survey* points out that past experience shows that an upward shift in money rates has no lasting influence on utility stock prices—market values are basically attuned to the secular trend of earnings and dividends which is unmistakably upward.

Southern Electrical announces promotions

WILLIAM J. HAGAN III, has been appointed director of electrical conductor sales of Southern Electrical Co., Chattanooga, an operation of the Metals Division of Olin Mathieson Chemical Corp., Derek Richardson, vice-president of aluminum sales, Metals Division, has announced.

Mr. Hagan, formerly assistant director of electrical conductor sales, succeeds H. H. Bullen who will continue his association with the company as a consultant.

Mr. Hagan has been associated with Southern Electrical Company since its founding in June, 1946.

Other appointments announced by Mr. Richardson are L. W. Carpenter, manager of field sales, and G. E. Thurman, manager of sales promotion.

Utilities group holds two meetings

THE ELECTRIC Light and Power Division of the Oklahoma Utilities Association recently held their Western and Eastern District meetings. The Western District meeting was held at Lake Murray Lodge, Ardmore, Okla., and the Eastern District meeting was held at the Aldridge Hotel, McAlester, Okla.

A. P. Burns, chairman of the Eastern District, presided at the Eastern meeting, and G. P. Middaugh, Western District chairman, presided at the Western meeting.

In accordance with the association's usual policy, almost identical programs were planned for the two meetings. D. J. Frandsen, general sales manager of the Public Service Company of Oklahoma and chairman of the Oklahoma Utilities Association, and J. E. Daley, assistant to the president, Public Service Company of Oklahoma were featured speakers for both groups. R. K. Lane, chairman of the board of the Public Service Company of Oklahoma, addressed the Eastern District meeting, and Donald S. Kennedy, president, Oklahoma Gas and Electric Co., was a featured speaker on the Western District program.

D P & L kicks off heating campaign

AN ELECTRIC heating promotion covering the relatively new electric heat pump and electric resistance heating has been announced by Dallas Power and Light Co.

Details of the promotion, described as an intensive, long-range program, were presented at two recent meetings in the firm's Northeast Service Center.

The first meeting was attended by 150 electric heat pump distributors, dealers, and manufacturers representatives. At the second meeting, 180 electric resistance heating equipment distributors and manufacturers representatives and electrical contractors heard about the new promotion. Also in attendance at the two meetings were representatives of the local insulation industry.

Sangamo cuts prices on power capacitors

EFFECTIVE immediately, the Sangamo Electric Co., Springfield, Ill., announces price reductions of approximately 20% on power capacitors to re-align prices with manufacturing costs and to accentuate the economies of supplying reactive power with capacitors rather than generation.

Good public relations urged for utilities

SPEAKERS at the 41st annual meeting of the Public Utilities Association of the Virginias, held in White Sulphur Springs, W. Va., hammered hard at the theme that the privately-owned public utility industry must do a better job of explaining itself to the public.

Giving a newspaperman's views on utility public relations, a Florida editor challenged utility companies to speak out and tell him (and the general public) what is good about the industry "before the public power boys have you deported from our shores on a trumped-up charge that you are an economic liability."

Utility companies have done an

W. J. Hagan, III L. W. Carpenter G. E. Thurman

outstanding job in rendering service to the public but their public relations effort resembles "a freckle-faced, bashful country boy at the ice cream social" according to Loyal Phillips, editor and publisher of the St. Petersburg *Independent*.

Phillips urged utility management to explain the achievements of the industry to the public through every available medium. He noted that he knew nothing about the contribution of the utility industry toward winning World War II although he was well-informed about the importance of the work of the railroads, the automobile manufacturers, and others. The difference is that those industries took great pains to tell the story of their war-time effort.

The even wider need for public education in the principles of the free enterprise system was cited by Dr. Clifton Ganus, Jr., dean of the School of American Studies, Harding College, Searcy, Ark. He stated that the peoples of all countries believe what they are taught to believe and that the American economic system can survive only through better economic education at all levels.

Chairman Myron R. Renick, of the West Virginia Public Service Commission, pinpointed the need for good public relations by regulated industries. He strongly recommended advance preparation of the public for rate increases through adequate information on the company's economic problems. He pointed out that inflation is primarily responsible for most rate cases that come before the West Virginia Commission and the public generally does not understand that neither the utility companies nor the commission can control inflation.

In a different vein, Dr. John Findlay, of the National Radio Astronomy Observatory, Green Bank, W. Va., described the new science of radio astronomy and the first radio astronomy observatory in the United States, which is being built in a mountainous section of West Virginia.

Some 450 management representatives of electric and gas utility companies in Virginia and West Virginia attending the meeting also heard reports of the association's work in the fields of accident prevention, area development, public relations, rural development and sales.

H. Atwood Hitch, vice-president Virginia Electric and Power Co., Richmond, Va., was elected president of the association at the concluding session of the annual meeting. He succeeds Hugh D. Stillman, division manager, Appalachian Power Co., Huntington, W. Va.

Dates Ahead

Southeastern Electric Exchange, Sales Conference, Roosevelt Hotel, New Orleans, La., Nov. 16-18, 1959.

2nd Southwest Heating and Air Conditioning Exposition, Memorial Auditorium, Dallas, Texas, Feb. 1-4, 1960.

Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 8-9, 1960.

1st National Electric House Heating Exposition, Sherman Hotel, Chicago, Ill., March 21-23, 1960.

Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., March 21-23, 1960.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Roosevelt Hotel, New Orleans, La., Apr. 7-8, 1960.

Missouri Valley Electric Association, Engineering Conference, President Hotel and Municipal Auditorium, Kansas City, Mo., Apr. 20-22, 1960.

DAY-BRITE NATIONAL SALES CONFERENCE—Representatives of Day-Brite's southern region pose around the pool during the company's recent sales conference held in Palo Alto, Calif. From left to right are: John Manos, Roanoke; Ladson Massey, Charlotte; Sidney Chilton, Memphis; Jim Foerster, Miami; Cecil Cannon, southern region sales manager; Jim Fuller, Birmingham; Breeden Moore, Myrtle Beach; Oren Ruff, Atlanta; Joe Crevasse, Jacksonville; George Jack, Tampa; Jim Branson, Jackson; Joe Booker, Nashville; Paul Hogan, New Orleans; Earl Dagenhardt, Richmond. (Kneeling) Roy Palmer, Jr. Raleigh.

Eric C. Summers, executive vice-president, Monongahela Power Co., Fairmont, W. Va., was named first vice-president of the association. Charles D. Lyon, vice-president, Potomac Edison Co., Hagerstown, Md., was elected second vice-president.

Officers re-elected were William F. Keehne, Applachian Power Co., as treasurer, and Arthur T. Ellett, Roanoke Gas Co., as assistant treasurer. Both are from Roanoke, Va.

AIEE elevates 26 to grade of Fellow

THE BOARD of directors of the American Institute of Electrical Engineers has elevated 26 of its members to the grade of fellow for outstanding contributions to the electrical art.

Among those honored and their citations are the following men from the South and Southwest:

Henry A. Clarke, superintendent, System Station Dept., Appalachian

Power Co., Roanoke, Va., "for contributions to carrier current relaying and ultrahigh-speed power circuit reclosing techniques."

James A. Cronvich, professor and head of the Electrical Engineering Department, Tulane University, New Orleans, "for contributions to medical practice through electronic applications and to teaching in this area of relationship."

Joseph W. Graff, chief electrical engineer, Alabama Power Company, Birmingham, Ala., "for contributions to power system planning."

John S. Jamison Jr., professor and head of the Electrical Engineering Department, Virginia Military Institute, Lexington, Va., "for contributions to engineering education."

Adolph H. Mergenthaler, chief design engineer, Southern Services, Inc., Birmingham Alabama, "for contributions to planning of economic power system generating capacity."

Joseph C. Michalowicz, department head, Electrical Engineering Department, Catholic University of America, Washington, D. C., "for contributions to the education of electrical engineers."

Lighting fixture maker builds second plant

THE LIGHT AND POWER Utilities Corporation of Memphis will open a second plant next spring in Olive Branch, Miss., according to the company's president, Murray Reiter. The company is a manufacturer of commercial and industrial fluorescent and incandescent lighting fixtures.

The factory, 28 miles from Light and Power's present site, will cost about $600,000 and will triple Light & Power's present space. According to Mr. Reiter, the additional facility marks the third expansion for the company in four years, and will give needed manufacturing space as well as room for additional expansion.

Construction of the 112,000 square foot plant should be completed in about eight months. The Mississippi factory will house facilities for the two Light and Power complete lines of electrical fixtures—"L & P" fluorescent fixtures and "Delta" incandescent fixtures. They are distributed in 38 states and many foreign countries.

The company moved to Memphis from New York state in 1946, and expanded its present plant at 1035 Firestone Blvd., Memphis, in 1955 and 1957.

Architect's drawing of the new Mississippi plant of Light and Power Utilities Corp., where both "L&P" and "Delta" fixtures will be made.

Allis-Chalmers names new officers

THE ELECTION of two new officers and the advancement of two other officers by the board of directors of the Allis-Chalmers Mfg. Company, has been announced.

Elected senior vice-presidents of the company were Boyd S. Oberlink and J. L. Singleton. Both previously were vice-presidents.

Roy M. Casper, general manager of the firm's Atomic Energy Division and L. W. Davis, general manager of the Farm Equipment Division were both elected vice-presidents.

B. S. Oberlink

Oberlink joined the company as a service school trainee in 1934 after his graduation from the University of Illinois.

Singleton began his career at Allis-Chalmers in 1926 on the company's graduate training course, following his graduation from Alabama Polytechnic Institute, Auburn, Alabama.

J. L. Singleton

Casper joined Allis-Chalmers in 1936 as a sales representative. Since that time he has been engineer-in-charge of motor-generator sales, manager of the electrical and power departments, and administrative assistant to the vice-president.

Davis joined the company as a blockman at the Oakland, California Branch in 1939. He has been general manager of the Farm Equipment Division since 1955.

Brown named president of Wagner Electric

AT A MEETING of the board of directors, George W. Brown was elected president and will serve as chief executive officer of Wagner Electric Corp. He was also elected president of its subsidiary, the Wagner Brake Company Limited of Toronto, Canada. He succeeds the late J. H. Devor.

George W. Brown

Mr. Brown came to the company as a student engineer in 1926, after graduating from the engineering school of Ohio State University. He served in various engineering capacities until 1937 when he was appointed personnel director. In 1952 he was

at the LOWEST COST YET!

You asked for such a fan — and here it is . . . the new BAR-BROOK BREEZEBUILDER-K, designed with your needs in mind. It's easy to install and operate, presents an attractive appearance and is *lower in price than any other Bar-Brook attic fan ever offered.*

Still, BREEZEBUILDER-K gives you top performance . . . up to 12,500 cfm with only a 1/3 H.P. motor. Comes in four compact sizes, with 24, 30, 36 and 42-inch fan blades. And the attractive aluminum shutter assembly is completely automatic, adds to the decor of any room.

FEATURES

Quiet, rubber-mounted dual ball bearings
Permanent "sealed-in" lubrication
Certified air deliveries from 7,000 to 12,500 cfm
Rubber-cushioned motor mount
Fan guaranteed 5 years; motor and belt, 1 year

the versatile New

BAR-BROOK*
BREEZEBUILDER-K

WRITE TODAY for free catalog showing complete line of fans, wall and ceiling shutters, and attractive prices.

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MANUFACTURING CO., INC.,

6135 Linwood Ave. Box 6638-F Shreveport, Louisiana

**T.M. Reg. U.S. Pat. Off.*

Concrete tight! Every size connector and coupling up to 2". Why settle for ordinary fittings when ETP gives you all this:

- New tough protection! Sparkling Zinc Chromate over plating to retard corrosion. Same as tested and approved by the U.S. Government for use in aircraft, rockets and missiles. Salt spray tested.
- Exclusive pre-set, deep-slotted STAKED screws. No backing out for conduit.
- Concrete tight with heaviest gauge wall thickness! Far surpasses U.L. requirements. U.L. file card E24788.
- Precision bevelled edges with extra heavy duty locknut.
- One piece solid tubular steel—cannot open or spread. Sized for uniformity.
- Available in ½", ¾", 1", 1¼" (one screw type) and 1½" and 2" (two screw type) sizes.

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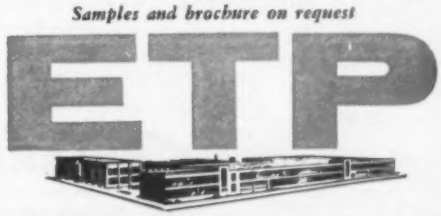

ELECTRIC TUBE PRODUCTS
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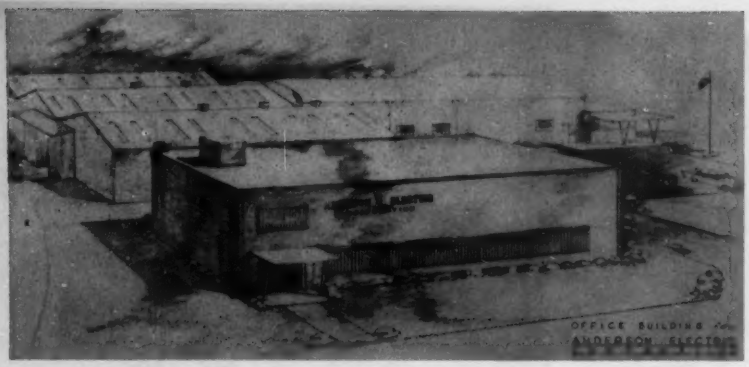
DEfender 5-8000



promoted to executive engineer, and in 1954 was elected vice-president in charge of manufacturing, engineering, purchasing, and industrial relations. He was elected director of the corporation in 1956 and executive vice-president in 1958.

Texas contractor relocates offices

AN AMARILLO, Texas, electrical contractor, Bill Nabors, who specializes in the rewiring of small motels and service stations, has located his office "on the scene."

Nabors moved from old quarters in downtown Amarillo to the motel area on Highway 66, east of the central area. Here many of the smaller motels are remodeling to meet competition from the bigger and newer courts.

The change in office location also was prompted by designation of the avenue which ran in front of his old address as a one-way avenue, which made it difficult for potential customers to reach the contractor's office.

Nabors also plans to operate a small retail fixture outlet at his new location.

Anderson tells plans for new home office

PLANS HAVE been completed for a new home office building for Anderson Electric Corp., Birmingham, Ala., it has been announced jointly by R. E. Schuler, chairman of the board of directors, and T. H. Fox, president.

J. H. Schuler, executive vice-president and general manager, stated the new building will be erected adjacent to the company's aluminum casting foundry at Leeds, Ala., a Birmingham suburb. Of contemporary design, the two-story brick and steel building will contain a total of 13,000 sq. feet. It will house Anderson's sales, engineering, accounting, production control departments, and executive offices.

Federal Pacific opens Birmingham office

FEDERAL PACIFIC Electric Company has established a district sales office in Birmingham, Ala., and appointed John N. Hutson district manager, it was announced by Harry E. Knudson, the company's general sales manager.

John N. Hutson

Located at 2803-A 19th Place, So., Homewood, Ala., the Birmingham district office will service the state of Alabama as well as the northwestern section of Florida. Like the other 83 Federal Pacific sales offices in the United States, it will handle the company's complete line of over 2000 electrical distribution and control products used by industry, electric utilities, and the building trades.

D. L. Harper named branch manager

D. L. HARPER, manager of the Peninsular district of the Graybar Electric Co., Inc., has announced that the Fort Lauderdale sub-branch has

TERMEND® LUGS

in new smaller quantity SLIP-TOP BOXES*

Benefit from these outstanding advantages . . .

HANDIER—shake out lugs as needed, no counting out.

MORE ECONOMICAL—no spilling or wastage.

LESS INVESTMENT—buy or put out on job only required number of packages of 50.

JUST ONE SIZE— terminates from 1 #16 thru 1 #8 (or any equivalent combinations.) Ring, spade and locking tongues for various stud sizes. All self-positioning in C24 pres-SURE-tool, which *also* installs Splice Caps for 2 #18 thru 2 #6.

Dispenses Lugs as needed

*An exclusive BUCHANAN development

BUCHANAN
ELECTRICAL PRODUCTS CORPORATION
HILLSIDE, NEW JERSEY

Representatives in
ATLANTA - BIRMINGHAM - CHARLOTTE, N.C.
FT. WORTH - HOUSTON - JACKSONVILLE
MIAMI - ST. PETERSBURG - SHREVEPORT
and other principal cities

Ask Your Distributor or Write for Bulletin S-11.

been made a full branch operation. Graybar opened its warehouse in Fort Lauderdale in 1953.

Mr. Harper also announced that M. A. Young has been appointed manager of the new branch. Mr. Young began with the company in 1947 as a stock clerk at Jacksonville. In 1949 he was made appliance salesman at Tampa, which position he has held until his present promotion.

Graybar's peninsular district includes Tampa, Jacksonville, Orlando, Miami, West Palm Beach, Fort Lauderdale, and St. Petersburg.

Ziglar promoted at Georgia Power

JAMES F. ZIGLAR has been named assistant manager of the Georgia Power Company's advertising department.

Mr. Ziglar, a native of Madison, N. C., was graduated from the University of North Carolina in 1949 with the bachelor of science degree in advertising. Before joining Georgia Power in 1951, he was employed by the D. H. Holmes and the Freitag advertising agencies. A former president of the Atlanta chapter, Southern Industrial Editors Assn., he is a member of the International Council of Industrial Editors and of the Public Utilities Advertising Assn.

Brief news notes of manufacturers

SMITHCRAFT Lighting, of Chelsea, Mass., has announced the opening of a new assembly plant in Chicago to serve the midwestern states. The assembly plant is located at 5475 North Northwest Highway, Chicago.

Resident manager of the Chicago assembly plant is Thomas J. Kerrins, Mr. Kerrins has been with Smithcraft for seven years.

* * *

S & C ELECTRIC Company has broken ground in Chicago for a $2-million laboratory. The laboratory will contain facilities for the development and testing (both electrical and mechanical) of high-voltage circuit-interrupting devices.

The electrical laboratory initially will house a 60,000 kva short-circuit test generator and equipment for 60-cycle flashover testing. Later, a surge generator and a 500,000-kva short-circuit test generator will be added.

* * *

ALLEN-STEVENS Conduit Fittings Corp. is building an addition to its present plant in Woodside, N. Y. This 20,000 square foot addition marks the sixth expansion in this firm's 13 year old history.

CHAMPION
of the four major brands of lamps
CHAMPION
stands out for
VALUE
Light/per/dollar . . . the measure of value in lamps . . . delivered in full measure by Champion lamps . . . sound reason for choosing Champion's as your company's best buy.
CHAMPION
Lamps
Incandescent
Fluorescent
Your best buy in lamps
CHAMPION LAMP WORKS, Lynn, Massachusetts

J. W. Muse J. S. Messer C. E. Harris

Appointments announced by Federal Pacific

FEDERAL PACIFIC Electric Company has announced three management appointments in its Economy Fuse Division.

Clifford E. Harris has been named division manager; John S. Messer, executive consultant; and John W. Muse, division marketing manager, according to Frank H. Roby, Federal Pacific executive vice-president.

Harris and Messer had been vice-president and president, respectively, of Economy Fuse and Manufacturing Company when Federal Pacific acquired the Chicago firm last January. Muse had been Federal Pacific's Boston branch sales manager.

Manufacturers appoint new representatives

THE INSULATOR Department, General Electric Co., Baltimore, Md., has appointed C. R. Bremhorst, district manager of the Saint Louis district, including Arkansas, southern Illinois, western Kentucky, eastern Missouri, and western Tennessee. Mr. Bremhorst's headquarters will be in Saint Louis, Mo.

C. H. CLOER has been appointed sales representative in the states of Georgia, Alabama, Florida, Tennessee, and Mississippi for the Vulcan Electric Co., Danvers, Mass.

* * *

FRED B. WOODS has been named to represent USCO Power Equipment Corporation in the states of North

Fred B. Woods

and South Carolina. Mr. Woods will call upon electric utility companies, municipal electric systems, REA cooperatives, and industrials. His headquarters will be in Cary, N. C.

* * *

THE FULLMAN Manufacturing Co., of Latrobe, Pa., has announced the following changes in sales representatives. Their new representative in Dallas, Texas is V. E. Stephens, 3523 Dutton Dr., Arthur H. Swartz of 5003 Kelso St., will represent Fullman in Houston, Texas.

* * *

MELVIN WRIGHT of 4708 W. Park Pl., Oklahoma City, Okla., has been appointed sales representative of Pass and Seymour, Inc. In addition, to Oklahoma, he also will cover parts of northern Texas and Arkansas.

* * *

FREDERIC H. EMMETT has become an associate of Frank C. McPherson, manufacturers representative. Mr. Emmett has Miami as his headquarters and will cover the Miami area from Vero Beach on the north to Key West on the south.

Men moving up in the industry

APPOINTMENT of new district managers has been announced by Southwestern Public Service Company, Amarillo, Texas.

Hardy Shelby, former district manager at Lubbock, was assigned to the Plainview office in the same capacity.

Gene McDonald, district manager at Levelland, replaced Mr. Shelby at Lubbock.

IN ELECTRIC HEAT THERMOSTATS... WHITE-RODGERS IS THE LEADER!

Use them with confidence—they're specifically designed for Electric Heat by White-Rodgers—world's largest maker.

Sold under the brand names of more than fifty manufacturers of quality electric heating equipment.

Type 1A61 World's Largest Seller

Type 1A65 Elegant New Companion

WHITE-RODGERS CO., ST. LOUIS 6, MISSOURI TORONTO 8, CANADA
ATLANTA 8, GEORGIA • 732 Spring St., N. W.

Rex Brown, administrative assistant to the south division manager at Lubbock, was named district manager at Levelland. Mr. Brown's former post remains open.

* * *

W. H. BURLESON, manager of the Power Utilities Department of Ohio Brass since 1937, has been appointed consultant to the general sales department on extra-high voltage transmission projects.

Succeeding him as manager is Paul M. Ross who has been associated with O-B for the past 25 years. His most recent position was manager of the equipment division of the power utilities department.

* * *

JOHN B. O'DONNELL has been appointed to the newly-created position of distributor sales manager of the

J. B. O'Donnell

Sola Electric Co. Mr. O'Donnell is a 19-year veteran in the organization. Prior to his appointment, he was New England district sales engineer.

* * *

APPOINTMENT of Walker H. Bateman, III, as manager of lighting and commercial equipment sales for Southwestern Public Service Company of Amarillo, Texas, has been announced by W. L. Pearson, vice-president of the firm. Mr. Bateman joined Southwestern Public Service in 1952 as a trainee and went with the sales department the next year.

* * *

APPOINTMENT of David J. McCarty as general sales manager and Ted Mager as field sales manager has been announced by Robert M. Salisbury, executive vice-president of Pass and Seymour Inc., of Solvay, New York.

Mr. McCarty's new duties will include the over-all planning of the company's sales and sale promotional activities. Mr. Mager's new duties will include over-all direction of the advertising department as well as the training and supervision of the sales staff.

AS AN INDUSTRY LEADER . . .

SUMMERS BUYS ONLY FROM QUALIFIED PEOPLE, OFFERING FINE SERVICE AND QUALITY PRODUCTS...

Alvin Pruitt, Summers Vice President, Paine's Chase Coffey and Dan Galvin, President of Galvin Sales Company, agree on the importance of dealing with experienced, well-established companies offering quality products.

PAINE People And Products Are Your Best Buy In Electrical Hanging, Fastening Devices...

What does it take to be your best supplier? The first thing most of you would say is — "You must offer the best products at a reasonable price backed up with service." But if you probe beyond the products, you come to people. And more than any single factor, people make the difference.

It takes people to make and sell products. And leaders in any field insist on people with know-how, experience, ingenuity and perseverance. People with these qualities, selling quality products, always give you the best buy and service.

Summers Electric Supply Company, a southern industry leader, is one of the many firms that believes Paine people and representatives like Dan M. Galvin have these qualities. The Paine name signifies people of high caliber servicing people with the same high-level business practices. Stop in today, try Paine products at your local supplier, and see for yourself.

THE PAINE COMPANY, 12 Westgate Road, Addison, Illinois

the best craftsmen always take PAINE'S

Spring Wing Toggle Bolts	Conduit Clamps	Star Drills
Expansion Anchors	Pipe Hooks and Straps	Malleable Shields
"Sudden Depth" Drills	Hanger Iron, perforated	Special Hanging and
Wood Screw Anchors	Expansion Shells	Fastening Devices

Technical books

for the electrical man

Engineering economics

"Engineering Economics for Professional Engineers' Examinations," by Max Kurtz. Published by McGraw-Hill, 327 West 41st St., New York 36, N. Y., 260 pages, illustrated, $6.50.

This newly-published book is devoted exclusively to helping engineers prepare for and pass the engineering economics section of the P. E. examinations. It brings together, in one compact volume, the facts, formulas, and tables that can help save time and insure accuracy in answering virtually any question likely to arise on the subject.

All important aspects of engineering economics are covered, including the media of investment, the time value of money, sinking funds and annuities, amortization of loans, valuation of bonds, depreciation, depletion, annual cost, capitalized cost, cost analysis, Kelvin's law, the law of contracts, the construction industry, professional ethics, and index numbers. Technical terms in finance and economics are clearly defined, and essential mathematical principles are concisely reviewed.

A helpful feature of the treatment is the many exercises and problems—showing typical questions asked in actual P. E. examinations throughout the country— mostly given with answers or worked-out solutions. Graphs are used extensively to illustrate problems and recommended methods of solution, and important mathematical formulas and tables are provided.

Electronics

"Electronics Reference Data, Volume 2." Published by Howard W. Sams and Co., Inc., 2201 E. 46th St., Indianapolis 6, Ind., 128 pages, illustrated, $2.50.

Howard W. Sams & Co., Inc., has announced the publication of a new group of selected articles from the *Aerovox Research Worker* under the title "Electronics Reference Data, Volume 2."

Seven sections in "Electronic Reference Data" cover such general topics as: antennas and transmission lines, UHF television, circuit design, audio, radar, meters and measurements, and specialized application and development.

Many of the most helpful and popular articles from the *Aerovox Research Worker* appear here under the general topic sections. A complete index pinpoints the exact subject matter quickly.

Rural electrification

"Farm Electric Sales Handbook." Published by Edison Electric Institute, 750 Third Ave., New York 17, N. Y., 66 pages, $3.50 plus postage.

This new handbook published by the Farm Group of EEI is designed for use by rural salesmen of electric power companies, electric equipment manufacturers, etc., and by agricultural extension services of colleges.

Subjects covered by the handbook include sprinkler irrigation systems, under-floor electric heating cable, heating cable to prevent pipes from freezing, electric equipment for the farm shop, electric dairy equipment, electric brooding, egg cooling and storage, etc. Each section outlines the principal advantages of the electric equipment discussed and gives such information as size of equipment needed for the various uses, capacities, operating costs, installation costs, initial investment costs, and average kilowatthour use.

The book also contains a number of useful tables such as a table showing the estimated kwhr use by various items of farm electric equipment ranging from corn shellers to water pumps, from cream separators to ventilating equipment; tables showing wire sizes for indoor and outdoor use; resistance and weight of electrical conductors; wire carrying capacities, etc.

The handbook, 4½" by 7½", is in loose-leaf form, contained in a sturdy, semi-flexible binder, with gold printing. The Farm Group of EEI plans to issue amendments and additions to the book from time to time.

Receiving tubes

"Essential Characteristics." Published by General Electric, Receiving Tube Dept., Owensboro, Ky., 260 pages, illustrated, $1.00.

A new edition of General Electric's receiving tube and television picture tube handbook "Essential Characteristics" now is available through authorized tube distributors and contains several significant improvements.

They both know the best buy in tape . . .

ACCURATE TAPES

FRICTION . . . . RUBBER . . . . PLASTIC

non-raveling
straight tearing
high tensile strength
strong adhesion
highly insulating

Send today for our most recent bulletin describing details.

ACCURATE MANUFACTURING COMPANY
Garfield, New Jersey

A new section lists the domestic near-equivalents of 95 foreign tube types for ready reference by service technicians. The standard prototypes of high reliability "Five-Star" tubes now are indicated.

Tube data listings now include screen watts. Added typical circuits include a stereo pre-amplifier and an AM/FM tuner. New construction details of two additional loudspeaker enclosures are given. The introductory section on "Interpretation of Data" has been revised.

A total of 1392 receiving and special-purpose tube types and 399 television picture tube types are listed with maximum ratings and typical operation data. Special coding indicates at a glance whether a type is metal, glass, miniature, or sub-miniature.

The new book includes classification charts for quick and convenient reference to tube families (diodes, triodes, etc.) that are available for specific classes of service. Outline drawings and configurations are keyed to each type, giving designers essential dimensions. Characteristics curves are given for 13 basic families of receiving tube types.

The book features comb binding which permits book to open flat.

Electronic equipment

"Electronic Components Handbook," Volume 3, edited by Keith Henney, Craig Walsh, and Harry Mileaf. Published by McGraw-Hill Book Co., 327 W. 41st St., New York 36, N. Y., 192 pages, illustrated, $10.00.

Publication of Volume 3 of the Handbook completes the series prepared to help designers of military and commercial electronic equipment select and use components which perform with maximum reliability. It gives factual information on certain electronic components in wide use in military electronic equipment.

Emphasis throughout this volume has been placed on component types for which military specifications are available, but other types are included in the discussions as well. Where such military specifications exist, they are summarized; in addition much general know-how, safety factors, and other matters useful to the equipment designer are included.

Volume 3 provides data on transformers and inductors, including power, communication, pulse, hybrid, bistable, logic and tuned transformers, as well as magnetic amplifiers and saturable reactors; connectors, including jacks, plugs, and sockets; wire and cable; terminals, including lugs, insulators, terminal boards and headers; tube shields; and hardware, including knobs, dials, indicating light assemblies, flexible shafting, and fasteners.

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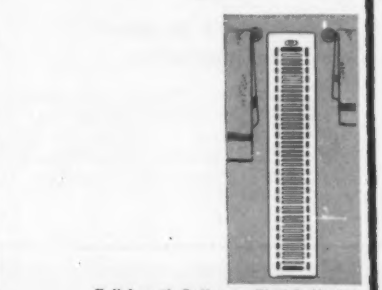
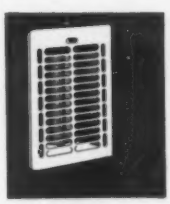


Full-Length Bathroom Electric Heater



Space Saver Bathroom Electric Heater

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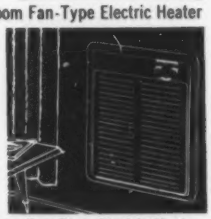
Small Room Fan-Type Electric Heater



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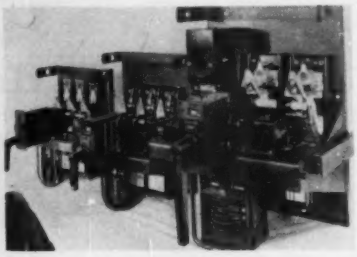
New products

Spring closing mechanism has no latches or triggers

A NEW spring-actuated mechanism for closing low-voltage power circuit breakers developed by the Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa., permits manually operated breakers to be used with selective or delayed tripping in applications involving fault currents of 50,000 amperes and below.

The new device assures rapid, safe closing against all fault currents. Features include simplicity, ruggedness, and reliability. The spring-closing mechanism involves no latches or triggers and the mechanism cannot stall or stick in any intermediate position.

Energy required to close the breaker is stored when the operator turns the operating handle and so compresses a spring. If torque on the handle is relaxed before the contacts start to close, the handle disengages and rotates freely back to its normal position; but if the handle is pulled far enough to begin contact motion, an overcenter compression device is



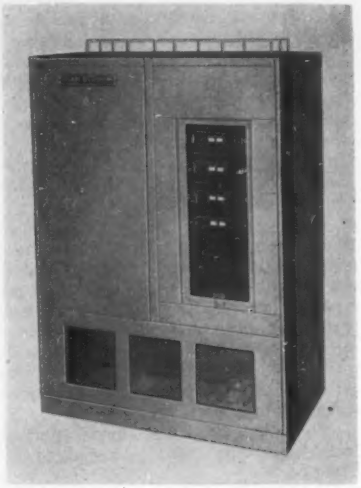
moved out of toggle and closing occurs quickly and positively. Speed and force of closing are independent of the force or speed with which the handle is operated.

Write P-1113 on reply card, pg. 19

Transformers designed for quiet operation

A NEW LOW-VOLTAGE Power-Zone package unit substation for use on 480-volt systems to supply 120/208Y circuits is available from Square D Co., 6060 Rivard St., Detroit 11, Mich. Designed for lighting, office equipment, and similar loads, the substations contain three-phase transformers from 75 kva to 300 kva. Up to 72" of panel space is available for molded case circuit breakers.

Compactly built, the Square D substation is only 60" long, 36" deep, and 79½" high. These dimensions provide easy movement through commercial



doorways, minimize installation space. Where space is critical, substations may be installed against the wall.

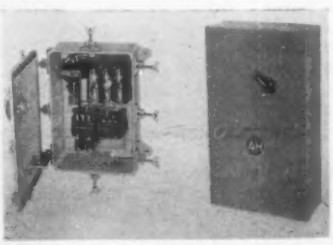
The open-ventilated dry-type transformers are designed for quiet operation. Sound levels have been reduced to 45 db for sizes up to 150 kva, 52 db for 225 kva, and 56 db for 300 kva.

Write P-1114 on reply card, pg. 19

New combination starters added to company's line

THE ARROW-HART & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn., announces the addition of sizes 3 and 4 combination starters, and cast aluminum weatherproof and explosionproof enclosures to its line of combination starters and enclosures.

The new NEMA 4 weatherproof enclosures are available for combination starter sizes 0 through 4; and the new NEMA 7 and 9 explosionproof enclosures are available for combination starter sizes 0 through 3. Both the weatherproof and ex-



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- One position base mounting
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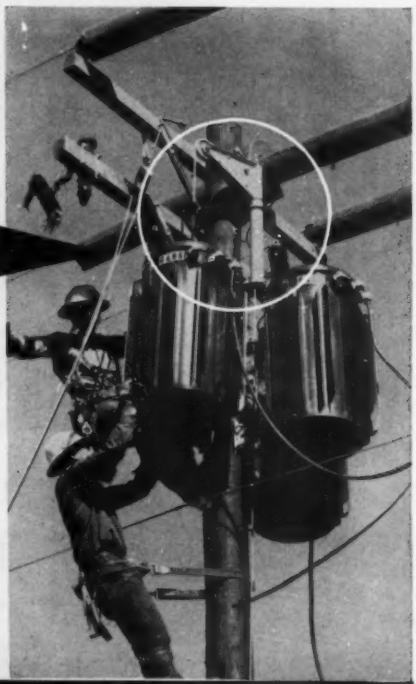
Save time with the MoPeCo hoist. You can install 3 transformers in only 30 minutes!



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plosionproof enclosures are of strong, cast aluminum. The manufacturer states that these enclosures are one-half the weight of old-style cast iron boxes and greatly facilitate the mounting and handling of the combination starters. Space savings can amount to 50% as well.

The combination starters in the complete Arrow-Hart line—non-reversing, reversing and two-speed types—boast the "right angle" design which, it is pointed out, assures important installation, maintenance and performance benefits.

Write P-1115 on reply card, pg. 19

3-wire grounding outlets equipped with short straps

A SERIES of new heavy-duty, 3-wire, grounding outlets with short straps has been introduced by Pass and Seymour, Inc., Solvay Station, Syracuse 9, N. Y.

All contacts, including grounding contact, are of high quality bronze and grip both sides of the cap blades

securely. Each contact is fully enclosed in an individual recess.

The face of the outlet, No. 5284, is contoured to permit easy insertion of cap blades. The outlet is available in 125-volt with parallel slots or 250-volt with tandem slots for back and side wiring or for side wiring only.

Back wiring is accomplished by inserting wires in holes and tightening binding screws. There is a handy strap gauge on the back.

Write P-1116 on reply card, pg. 19

Weatherproof plate protects a-c switches

HARVEY HUBBELL, Inc., Box 4, Barnum Station, Bridgeport, Conn., has introduced a weatherproof "Insulprene" plate designed to protect "Presswitch" a-c switches when used outdoors. The combination plate and "Presswitch" provides a dependable outdoor switch which is protected at all times from moisture, dust dirt, or other adverse conditions.

Although completely sealed in, the "Presswitch" can be operated at any

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Hold it until you read what it says about Circle A-W's new products.

My granddaddy says advertising is a waste of money unless people like you read his ads and buy his products. And I * aim to see that you do just that. So read these specifications and then call your nearest electrical wholesaler and place your order. Do it now, while I still have the drop on you.

1. 100 Amp. Outdoor Meter and Breaker Combination with 100 amp. main breaker on 20 pole load centers, surface or semi-flush. Catalog No. AWIM1-20LCR.

2. Power Outlet for Temporary Service 1-20 Amp. 2 Pole and 1-15 Amp. single Pole G.E. Breakers, 1-20 Amp. 250 Volt Twist Lock and 2-15 Amp. 120 Volt Recepticals. Prewired at factory. Catalog No. AWTS.

* Our priceless model is Jill Floyd, granddaughter of Al Johnson, president of Alwalt Manufacturing Company and Circle A-W Products Company.

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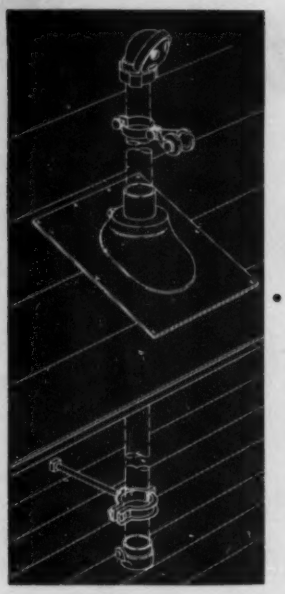

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Now, you can have exactly the right fittings for any mast installation...quickly...at lower cost. Just select the M&W Mast Kit to fit your needs. Varied assortments for 1¼", 1½", 2" or 2½" sizes, split-clamp or pipe strap conduit support, make it easy for you to pick the one kit that best suits your requirements. Best of all, M&W Kits cost less than individual fittings.

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the original snap-on clamp

SNAPS TIGHTER, HOLDS ITS GRIP

easier to sell because it's easier to use

WHY it's better—The B-I SNAP STRAP has the "hold bump" at the open end of the bracket—really grips—resists slips like an alligator wrench! Ribbed bracket adds to the snap, provides rigid contact support of the conduit!

SPEEDS WORK... MORE JOBS, MORE PROFITS—Faster installations mean more profit for installers and their suppliers. The SNAP STRAP *means* faster installations... eliminates time-wasting fumbling, dropping, annoyance—all the *temper* is in the SNAP STRAP. Made of heavy gauge steel, zinc plated after fabrication. Wide range of sizes for rigid and thin-wall conduit.

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Griffin & Griffin, 1185 Howell Mill Rd., N.W. Atlanta, Ga.
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time simply by pressing the raised surface of the plate where indicated on the outside. "A press and it's on, another press and it's off." There are no covers to lift, no caps to pull off or unscrew. The device remains sealed in throughout the year, yet is always operable "ready to work" on docks, building exteriors, porches, patios, breezeways, etc.

The plate and the switch will be packaged and sold as a unit. Weatherproof plate and "Presswitch" combination will be available in 15 or 20 ampere, 120-277 volt ratings in single pole, double pole, three-way and four-way units.

Write P-1117 on reply card, pg. 19

Improved light distribution provided by new reflectors

IMPROVED light distribution is provided by new slotted reflectors, from Crouse-Hinds Co., Wolf and 7 N. Sts., Syracuse 1, N. Y., now available for both explosion-proof and vaportight Condulet lighting fixtures. Slotted reflectors eliminate harsh brightness contrast, improving visibility and seeing comfort. Worker fatigue, and accidents are reduced, while production increases in machine work, assembly, and inspection operations.

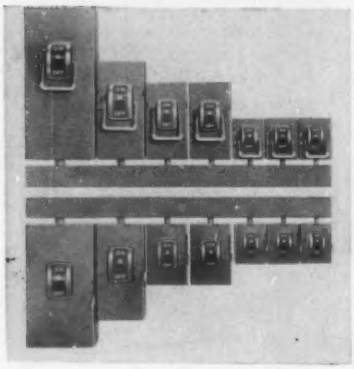
The up-light of slotted reflectors eliminates dark, dungeon-like areas above reflectors. Fixture operating temperatures are lowered, and when workers must work near low-hanging fixtures, this results in appreciable increase in comfort as the reflected

heat is reduced to a minimum. The circulation of air through the reflector reduces accumulation of dirt and dust, simplifying maintenance.

Write P-1118 on reply card, pg. 19

Safety switch design cuts space requirement

BOTTOM HINGING and front operation on new safety switches from General Electric, Circuit Protective Devices Dept., Plainville, Conn., permit significant economies in space where only limited mounting space is available.



Because there is no projecting mechanism or hardware on the sides of the switches, according to General Electric engineers, the devices may be ganged virtually one against the other.

The bottom hinged cover detaches by removing only one screw, a feature which greatly speeds and simplifies installations.

These features highlight a new line of 30 through 600 ampere light and heavy-duty switches.

Write P-1119 on reply card, pg. 19

Wall, floor, bathroom heaters redesigned

A NEW LINE of electric heating equipment — completely redesigned wall, floor, and bathroom models — has been introduced by the Westinghouse Electric Corp., P. O. Box 2278, Pittsburgh 30, Pa.

Styled for use in today's homes, apartments, schools, and offices, each of the models has a sloped control panel that is easier to read and to operate.

The wall models available in seven sizes from 1,000 to 4,000 watts will maintain the desired temperature within two degrees Fahrenheit over a range of 55 to 85 degrees. An aluminum-finished grill that is corrosion resistant conceals the heating elements, while the neutral tone of the charcoal and beige coloring blends with any room.

Supplying quick heating for bathing or dressing, the bathroom models have an aluminum grill with an anodized satin finish. They are available in two sizes, 1,250 or 1,500 watts, with or without adjustable heat control.

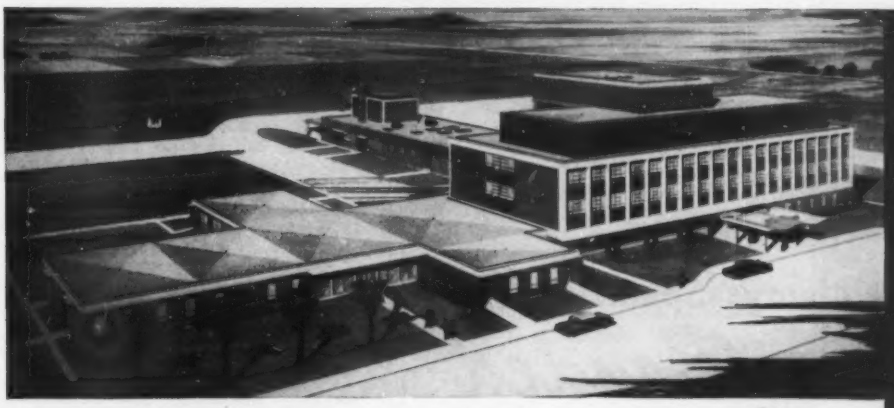
The floor models come in sizes of 2,000, 3,000 or 4,000 watts and are especially suited for use in recreation rooms, sun porches, or work areas which are difficult to heat. These units are easily moved from room to room without requiring any installation. They have a built-in temperature control.

Write P-1120 on reply card, pg. 19

Outlet cover snaps closed and can be padlocked

BELL ELECTRIC CO., 5735 S. Claremont Ave., Chicago 36, Ill., has made available a heavy-duty, weatherproof cover plate for 20, 30, and 50 ampere receptacles. Cover plate snaps closed and can be padlocked to prevent tampering.

The new cover plate is designed for use in industrial, railroad, farm, marine, aircraft, and commercial applications. Cover snaps open and holds the open position when in use;



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P&S 20AC1 heavy-duty super AC switches are made with heavy silver alloy contacts mounted vertically at the point of least vibration. P&S super AC switches can be used at full-rated capacity for tungsten filament lamp loads and fluorescent installations.

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after use, cover snaps shut with slight pressure of finger, providing dirt and moisture-free weatherproof protection. Hasp allows padlocking, prevents misuse or tampering.

Constructed of non-corroding die-cast aluminum, Bell's No. 360 Saf-T-Lok snap-cover plate will accommodate 20, 30 or 50 amp power receptacles or switches.

Write P-1121 on reply card, pg. 19

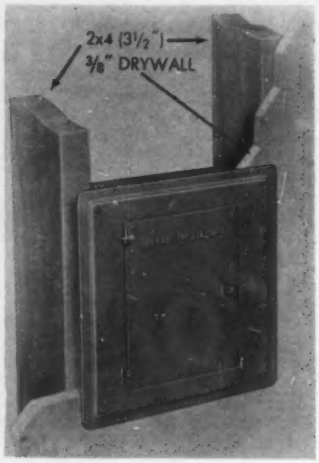
Load centers feature offset flush front flange

FLUSH FRONTS for 100-ampere circuit breaker load centers from General Electric, Circuit Protective Devices Dept., Plainville, Conn., now incorporate a special drawn offset flush front flange.

This flange is offset ¼-inch, which meets exactly the depth requirement for ⅜-inch drywall installations used over new 3½-inch deep 2 x 4 lumber.

In addition to meeting this important dimensional requirement the improved design greatly enhances the appearance of the finished installation.

Write P-1122 on reply card, pg. 19



200-ampere fusible main raintight, door operated

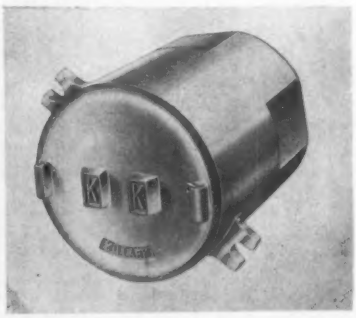
NEW RAINTIGHT 200 ampere fusible main, door operated from Wadsworth Electric Mfg., Co., Covington, Ky., was designed for the modern electric housepower home. The 200 ampere main switch controls all of the circuit breakers in the enclosure, which may be had in 24, 32, or 40 (15 to 50 ampere) single pole breakers. With Wadsworth's sequence bus design any two adjacent breaker positions may be double pole. The branch circuits may be used for lights, appliances, washer, dryer, range, water-heater, heating panels, air conditioners, and etc.

The circuit breaker bus bar assembly is attached to an easy removable self-aligning metal mounting plate. Line connectors and current carrying parts are plated. The dead front is the easy removable type to expose the interior.

Write P-1123 on reply card, pg. 19

Explosion-proof fitting of non-rusting aluminum

AN EXPLOSION-PROOF fitting for concrete mounting has been announced by the Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.



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Identified as Series GRC, the new fitting is available with blank cover for use as a splice box and hub cover suitable for fixture hanging.

The fitting meets Code requirements, and is made of non-rusting aluminum. It is available in conduit sizes from ½" to 1" in a wide variety of hub styles.

Write P-1124 on reply card, pg. 19

Floor insert heaters heat problem areas

A NEW floor insert electric heater, designed by Electromode, P. O. Box 1052, Rochester 3, N. Y., now solves the problem of supplying safe and efficient heat in areas where it is not practical or possible to install many other types of heaters. Such problem installations include areas adjacent to full length picture windows, sliding glass doors, base of an open stair well, or the inner side of exterior doors. Since this new heater mounts flush with the floor, it causes no obstruction in front of windows or in passageways. A rising wall of heat blankets these "problem" areas.

The heater is easy to install in wood or concrete slab floors and is completely hidden except for the grille. Grilles are painted a bonderized base gray to allow for easy refinishing in any shade to harmonize with floor or room color scheme. With the Electromode floor insert electric heater, there is no dirt, dust, grease, or smoke to soil furnishings. Periodic cleaning of the heater is simple and entirely safe.

Write P-1125 on reply card, pg. 19

Electric heat thermostat has "off" position on dial

A NEW double-pole disconnect version of its contemporary-styled electric heat wall thermostat was recently introduced by White-Rodgers Co., 1209 Cass Ave., St. Louis 6, Mo. Offered as a companion to the White-Rodgers Type 1A65 "Elegance" thermostat, the new double-pole model is called Type 1A66. Primary use of the 1A66 is areas where wiring codes require a positive break of both sides of a 240-volt line.

Finished in gleaming gold and beige vinyl-leather, the new 1A66 is a control built to maintain a constant level of comfort in electrically-heated homes. Actually a highly-sensitive thermal element, the control knob of the 1A66 is fully exposed to both room temperature and radiant heat. Any change in comfort level is immediately "felt" by the element and the silent switch instantly actuated to compensate.

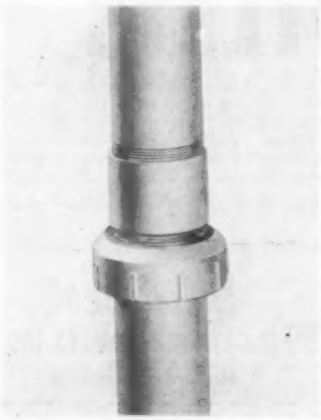
In addition to the heat range selection of 55° to 85° F., the new White-Rodgers 1A65 has an "OFF" position on the dial. When the knob is set at "OFF", both sides of the power line are positively disconnected for shutdown as for week-ends or vacations. No separate disconnect switch is needed. Differential is ½°F.

Write P-1126 on reply card, pg. 19

Conduit ventilator adapter for 3, 4, and 5-inch conduit

A SPECIAL conduit ventilator adapter Type "KVF" is being manufactured by O. Z. Electrical Manufacturing Co., Inc., 262 Bond St., Brooklyn 17, N. Y.

When used at the bottom of a vertical conduit riser which is properly vented at the top, the Type "KVF" provides for the movement of cooling air throughout the riser. The reduced temperature in the riser helps make



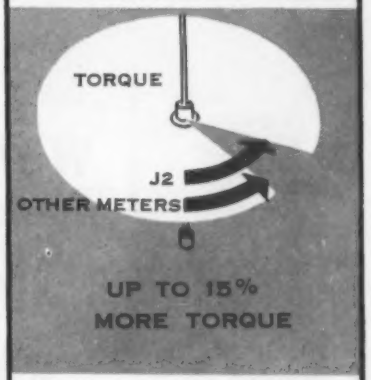
METERMAN'S CHECK LIST

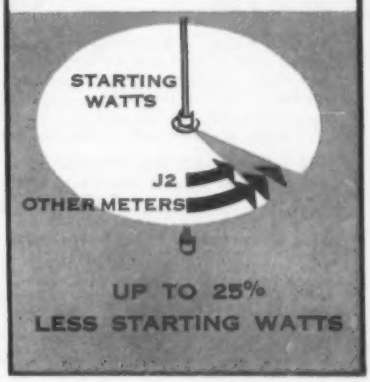
Get Sustained Accuracy Even as System Capacity Grows

Sangamo J2 Watthour Meters provide the long-life accuracy that is so essential as test intervals lengthen and residential loads increase. Uniform load curves from 1.5 through full 200 amperes prove the J2's sustained, "straight line" accuracy on both light and heavy loads.

The J2, with its slow speed, exceptionally high torque, and ability to begin measuring on fewer starting watts than other meters, provides unexcelled extended range metering for all services, present and potential.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS





the temperature throughout the conduit run more uniform, improving the service life of the cable and increasing its load carrying capacity.

Standard fittings are of cast aluminum, accommodating conduit sizes of 3, 4, and 5 inches. Fittings are also available in bronze.

Write P-1127 on reply card, pg. 19

Controlled floodlighting available at low cost

ARCHITECTS and engineers concerned with "controlled" floodlighting for small areas and doing the job at relatively low cost will welcome the new "3020 Series" of mercury vapor reflector lamp floodlights, from Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

The floodlight has been especially designed for gasoline service stations, parking lots, outside storage areas, and other open locations. They fully utilize all the light available from the lamp instead of permitting a portion of the light to escape. This results in greater lighting eficiency in target areas.

Appleton "3020 Series" floodlights use 400-watt R52 hard glass color improved and white mercury vapor lamps and are fully adjustable for horizontal and vertical aiming. Choice of three styles of mounting hoods for easy installation.

Write P-1128 on reply card, pg. 19

Lens boxes can be fitted with lens or glass bowl

DAY-BRITE Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo., announces a new line of recessed incandescent lens boxes called Uni-Frame. The new series includes the company's original 12-inch Uni-Frame, and now offers two basic boxes. They can be fitted with either lens or glass bowl, frames, and splays to make a total of 24 basic appearance combinations. By mixing of

frame and splay finishes, possibilities are even greater.

Lighting designers can choose either a Pyrex tempered prismatic lens or a Pyrex Double-Tuf glass diffusing bowl. Outer frames and optional splay trims come in baked white enamel on steel, satin aluminum (anodized), or satin brass finish (anodized).

The new 10-inch Uni-Frame accommodates 100-150 watt lamps. Twelve-inch Uni-Frame accommodates 200-300 watt lamps. High lighting efficiency is provided by a one piece Alzak aluminum reflector. Wiring box meets all code requirements. Of rigid, seamless construction, Uni-Frame requires no plaster frame, and can even be installed in concrete ceilings.

Write P-1129 on reply card, pg. 19

FOR OUTDOOR CONSTRUCTION, INDUSTRY, FARMS, RANCHES, MOBILE HOME PARKS!

MODEL P-55-F

New!

WEATHERPROOF

All-Purpose "FUSED"

POWER OUTLETS

MODEL P-55-F as illustrated, has a 60 amp. 250 volt, 4 wire power receptacle, protected with a two pole 60 amp. pull out block. Also has a grounded type duplex receptacle protected with a separate fuse. Top hub and bottom KO's facilitate overhead and underground connections. Completely weatherproof. Cover closes completely, when in use and can be padlocked. Also, Circuit Breaker Model P-55-C . . . same as above with circuit breaker instead of fuse.

One hundred other standard models to choose from in fused or circuit breaker types with 15 to 60 amp. 3 and 4-wire receptacles.

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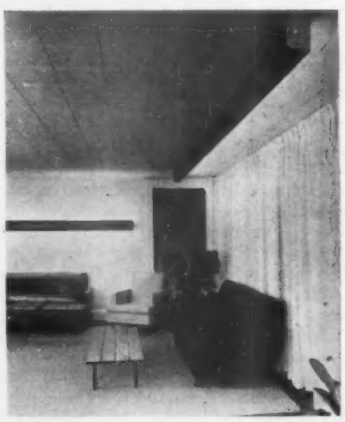
EDWARD W. FISHBURNE, P. O. Box 2407, Greensboro, N. C.
J. W. GATCHELL CO., 407 Broadway, Kansas City 5, Mo.
JONES-PHILIBERT & CO., 358 Sauve Rd., New Orleans 23, La.
JOHN A. KIBSH METAL PROD., 1316 N. Carroll, Dallas, Texas
FRANK G. McPHERSON, 6417 7th Ave. N., St. Petersburg, Fla.
GEORGE L. WASHINGTON, 1296 N. Decatur Rd., Atlanta 6, Ga.
J. LOUIS WEYHING, 1914 Rutherford Ave., Louisville 5, Ky.

Midwest
ELECTRIC PRODUCTS, INC.
DEPT. ES
MANKATO, MINNESOTA

Line of structural lighting available for delivery

LAM, INC., of Wakefield, Mass., manufacturers of lighting fixtures for residential and commercial application, have announced that their new line of prefinished structural lighting called Modulume is now fully cataloged and available for delivery anywhere in the United States and Canada.

The Modulume line is composed of both individual fixtures for specific lighting jobs and units which can combine to produce fitted installations both around corners and to any length. Modulume versatility makes



structural lighting available as a ready-to-install building element. Curved wood shields in natural finish are combined with fluorescent strip in a variety of profiles each designed to produce a specific distribution of light. There is also a Modulume line in luminous plastic.

Write P-1130 on reply card, pg. 19

All aluminum post light of contemporary design

McPHILBEN Lighting, Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y., has introduced a modern post top light No. 4-100 designed for effective and aesthetic lighting of driveways, walkways and gardens in housing developments, garden apartments, and cam-

pus areas. It is also suited for lighting swimming pools, drive-ins, recreational areas, and shopping centers.

The post light provides uniform symmetrical light distribution and may be used with standard incandescent, medium-base lamps up to 300 watts (PS-30), or with mercury vapor lamps rated through 250 watts.

The post light features all-aluminum anodized construction and is enclosed and gasketed to withstand the most severe weather conditions. The contemporary design of the post light presents a pleasing appearance when mounted on tapered aluminum poles of 8, 10, or 12 foot heights.

Write P-1131 on reply card, pg. 19

New Power Groove fixture designed for gymnasiums

PARAMOUNT Industries, G-1080 Ballenger Rd., Flint, Mich., has announced the development of a new Power Groove gym fixture providing the answers to many special problems of gymnasium lighting. The new fixture, designed especially for school athletic areas, has a welded box-frame body so strong that it will support the weight of four large men.

The most important construction feature of all is the interlocking of reflectors and baffles into one integral assembly formed of extra heavy .032" aluminum and engineered for 38° shielding. All reflecting surfaces are shaped of parabolic curves to conquer glare and direct the light down where it is needed. These reflector and baffle surfaces are first etched to eliminate any possibility of specular reflection, and then anodyzed to provide lasting high efficiency.

Maintenance is held to a minimum. Two spring-release mechanisms allow the complete reflector assembly to be lowered to an attached chain support position for cleaning and re-lamping. Location of the ballast in a special cooling recess in the back of the channel permits quick and easy change of ballasts without disturbing lamps or reflectors.

Write P-1132 on reply card, pg. 19

Helpful literature

A new catalog featuring their line of **residential lighting** fixtures has recently been issued by the **John C. Virden Co.**, 6103 Longfellow Ave., Cleveland 3, Ohio. The 48-page booklet is illustrated and in color. It pictures and describes incandescent and fluorescent fixtures for every room in the house and every design motif.

Write B-1133 on reply card, pg. 19

The **Standard Transformer Co.**, Dana Ave., Warren, Ohio, has issued a new catalog (S-503) describing its redesigned line of current, potential, and metering **transformers.** The line consists of high accuracy instrument transformers for use with watthour meters, as well as types designed for use in switch-gear.

Write B-1134 on reply card, pg. 19

The **Leviton Manufacturing Co.**, 236 Greenpoint Ave., Brooklyn 22, New York, manufacturers of electrical **wiring devices,** announces the publication of a new type of catalog whose first issue contains a listing of over 600 items complete with numerical and subject indexes to simplify selection of items. This abridged catalog has been prepared for distributors, contractors, electrical engineers, and estimators.

Write B-1135 on reply card, pg. 19

Now available from **Lighting Products Inc.**, P. O. Box 338, Highland Park, Ill., is a bulletin describing their **Power-Lux luminaire** designed for commercial application of new, improved Power Groove lamps. The bulletin also gives full specifications, photometric, dimensional, and ordering data.

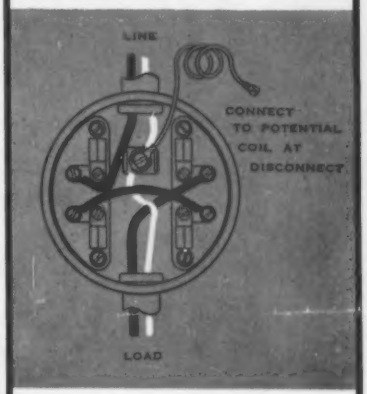
Write B-1136 on reply card, pg. 19

A sixteen page colorful catalog, 14-B1, is being used by **Furnas Electric Co.**, 1064 McKee St., Batavia, Ill., to introduce a new completely redesigned line of **magnetic starters** through

METERMAN'S CHECK LIST

Protect Today's Investment in 2-Wire Services

Sangamo J2 Watthour Meters are designed so that standard 3-wire meters can be installed on 2-wire service by simple socket connections.



All connections are external, make conversion from 2-wire to 3-wire service simple. The same meter is used for the new 3-wire service; there are no returns to the shop for conversion. The J2 eliminates the need to retire meters before their time, protects investments in 2-wire services, reduces and simplifies stock inventory.

SANGAMO Electric Company
SPRINGFIELD, ILLINOIS

15 hp., 440-550 volts. The catalog lists such features as: All components front removable, dual voltage coils reconnectable on the job, "trip-free" thermal overload relays with trip indicator.

Write B-1137 on reply card, pg. 19

Line patrol, construction, and right-of-way **maintenance by helicopter** are among the topics covered by a booklet recently released by **Hiller Aircraft Corp.**, 1350 Willow Rd., Palo Alto, Calif., builders of the 305 hp 12 E helicopter. Photographs of Hiller 12 E helicopters at work in the field, brief performance specifications, and information on charter operator services are also presented.

Write B-1138 on reply card, pg. 19

A 16-point checklist for selecting **classroom lighting** equipment is available together with complete catalog information and technical data, from **Benjamin Electric Manufacturing Co.**, Dept. E-5, Des Plaines, Ill.

Write B-1139 on reply card, pg. 19

A new catalog, showing a full line of **pole line hardware** items and construction specialties has been published by **Oliver Electrical Manufacturing Co.**, 170 Angell St., Battle Creek, Mich. Known as Catalog No. 59, the new publication follows the format for "briefalogs" as suggested by the NAED Power Apparatus Committee. The catalog is a loose-leaf book in which products are listed in alphabetical order.

Write B-1140 on reply card, pg. 19

A new 16-page publication from **General Electric Co.**, 1 River Rd., Schenectady 5, N.Y., describes their **network transformers** in ratings from 300 to 2500 kva and 5 to 34.5 kv for a-c secondary network systems. The two-color bulletin illustrates benefits of the Vaultmaster unit and discusses: new "Evans" core and winding design, new panel radiators, an improved Melaprene "sandwich" paint finish, and new welded low-voltage bushings.

Write B-1141 on reply card, pg. 19

A newly published booklet, entitled, "Tips on Ultrasonic Cleaning," is being offered by **Circo Ultrasonic Corp.**, 51 Terminal Ave., Clark, N. J. The 12-page booklet includes a simplified explanation of the basic principles of ultrasonics and a brief description of the generating equipment and transducers required for **ultrasonic cleaning.**

Write B-1142 on reply card, pg. 19

Bulletin 3-15, covering a full line of **panel instruments** ranging from those used in standard commercial applications to those used for military purposes, has been made available by **Federal Pacific Electric Co.**, 50 Avenue L, Newark 1, N. J.

Described in the 24-page catalog are a-c meters, d-c meters, elapsed time meters, aircraft instruments, and shunts and current transformers.

Write B-1143 on reply card, pg. 19

Bulletin GEA-6943, 12 pages, from **General Electric Co.**, 1 River Rd., Schenectady 5, N. Y., describes their new line of mercury luminaires for **roadway lighting.** The 250-, 400-, and 1000-watt luminaires feature improved lighting performance, high electrical efficiency, and low installation and maintenance costs. The bulletin gives application data for various types of roadway lighting with diagrams, photos, and photometric data.

Write B-1144 on reply card, pg. 19

Bulletin GEA-6978, four pages, from **General Electric Co.**, River Rd., Schenectady 5, N. Y., describes General Electric's new super-compact **substations** designed for application on long, lightly loaded rural or suburban power lines. The substation consists of a three-phase medium transformer—rated 501 to 7500 kva, 69 kv and below—and at least one transformer-mounted oil circuit re-

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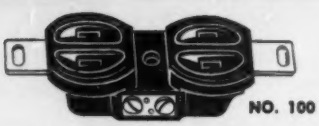
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NO. 102

EXCLUSIVE — No. 102 — features double-wipe contacts

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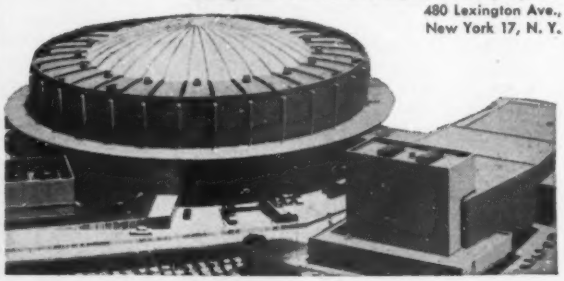


closer, both pictured and described in the bulletin. Charts show load current ratings and substation arrangement of elements.

Write B-1145 on reply card, pg. 19

A new 16-page catalog with illustrations from **Sherman & Reilly, Inc.**, First and Broad Sts., Chattanooga 2, Tenn., features many new items for **conductor stringing;** such as, utility snatch blocks, pole mounted bracket, aerial cable blocks, and larger sizes of conductor stringing blocks. Of special interest is a section describing their permanently bonded type GNA neoprene sheave lining.

Write B-1146 on reply card, pg. 19

"Meter Buyers' Guide," Bulletin GEC-1400B, 64 pages, from **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y., provides up-to-date information on General Electric's line of single-phase and polyphase watthour meters, watthour demand meters, meter sockets, and water-heater time switches. The 1959 edition of the **buyers' guide** features a new, quick-reference selection guide on "Standard Meter Applications," and an index which provides references to proper mounting equipment.

Write B-1147 on reply card, pg. 19

Bulletin 5-050, describing the line of Type CDG **time overcurrent relays** manufactured by **Federal Pacific Electric Co.,** 50 Paris St., Newark 1, N. J., is now available.

Amply illustrated, the two-color, 16-page catalog covers both the application and the construction features of these protective devices used by utility and industrial companies to protect electrical equipment.

Write B-1148 on reply card, pg. 19

Bulletin GEC-1400B, 64 pages, provides up-to-date information on the line of single-phase and polyphase **watthour meters,** watthour demand meters, meter sockets, and water-heater time switches from **General Electric Co.,** Schenectady 5, N. Y. The 1959 edition of the buyers' guide features a new, quick-reference selection guide on "Standard Meter Applications," and an index which provides references to proper mounting equipment.

Write B-1149 on reply card, pg. 19

A new concept in **power switching centers** is described in a new bulletin published by **I-T-E Circuit Breaker Co.,** 1900 Hamilton St., Philadelphia 30, Pa.

The 20-page, two-color bulletin furnishes detailed application and design information to aid contractors, consulting engineers, and industrial application engineers in selecting and specifying 4.8- through 14.4-kilovolt power switching center equipment made by I-T-E's Greensburg Division.

Write B-1150 on reply card, pg. 19

Cutler-Hammer Inc., 315 N. 12th St., Milwaukee 1, Wis., has announced the availability of a new 12-page booklet covering its complete line of factory-assembled **fusible entrance equipment.**

Data provided in the publication includes descriptions, photos, wiring diagrams, and enclosure dimensions for all series and parallel connected equipment having ratings of 30 amperes through 200 amperes.

Write B-1151 on reply card, pg. 19

A new, 2-color, 8-page catalog RSC-559 illustrates and describes improved Dualcote rigid **steel conduit,** couplings, and elbows from **Walker Brothers,** Conshohocken, Pa. Laboratory tests report on Dualcote's ability to resist corrosion due to chemical attack. Corrosion problems are discussed and special fields listed where Walker Dualcote may be used to advantage.

Write B-1152 on reply card, pg. 19

A comprehensive bulletin designed to aid in the selection of its new Urelite individually enclosed low-voltage **power circuit breakers** has been published by **I-T-E Circuit Breaker Co.,** 1900 Hamilton St., Philadelphia 30, Pa.

The eight-page bulletin describes engineering advances incorporated in the new breakers and enclosures and provides complete application data.

Write B-1153 on reply card, pg. 19

Construction features of their substation and pole-mounted **power factor capacitors** are described in a new bulletin released by **Allis-Chalmers Manufacturing Co.,** 938 S. 70th St., Milwaukee 1, Wis.

The capacitors are available in ratings of 25 and 50 kvar in 2400 through 7960 volts. The bulletin shows how Allis-Chalmers quality control is applied in the production of the capacitors. It includes a cutaway view to show the capacitor's design advantages.

Write B-1154 on reply card, pg. 19

A two-page bulletin describing the new **packaged RF-2 switches** for sectionalizing and isolating applications is available from **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y. The flexible switch can be installed in either vertical or horizontal position. The bulletin gives complete dimension and rating data on the switches which are rated from 7.2 to 69 kilovolts and 400, 600, or 1200 amperes.

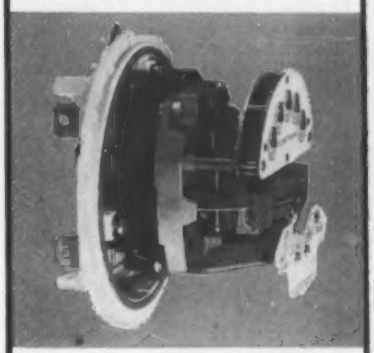
Write B-1155 on reply card, pg. 19

A new 16-page bulletin from **Irving B. Moore Corp.,** 65 High St., Boston, Mass., describes their **industrial rubber products** and materials including silicones, Buna-N, GR-S, synthetic, neoprene, and teflon. Primary physical properties of the above and other compounds, along with com-

METERMAN'S CHECK LIST

Stop a Meter Maintenance Problem... *CORROSION!*

The Sangamo J2 Watthour Meter has corrosion resistant construction designed to end maintenance problems caused by weather and atmospheric conditions.



The corrosion resistant finishes used on the J2 are the finest available, anywhere. But, they do change (for the better) because the search for ideal finishes is never-ending. Meters are tested under actual operating conditions in corrosive atmospheres even as Sangamo chemists develop new finishes. As a result of these tests and continuing chemical research, the corrosive resistant characteristics of the J2 meter are being improved constantly.

Get the whole story of the J2... It's told in an informative booklet titled "Meterman's Check List." Write for your copy today.

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MALLEABLE IRON METAL-PIPE POLE BASE

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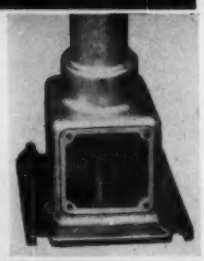

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HOPE ELECTRICAL PRODUCTS CO.

41 Long Ave., Hillside, N. J., ELizabeth 4-7837

parative properties of natural and synthetic rubbers, are detailed in this bulletin.

Write B-1156 on reply card, pg. 19

A new illustrated 20-page bulletin from **General Electric Co.**, 1 River Rd., Schenectady 5, N. Y., describes their latest **air blast power breakers** for high-voltage circuit protection. Designated type ATB, the breakers are built for the full range of transmission voltages.

Write B-1158 on reply card, pg. 19

United Lighting and Ceiling Co., 3120 Chapman St., Oakland 1, Calif., has announced that their study of **integrated ceilings** is now available to all architects, electrical consulting engineers, and general contractors. This study contains description of luminous or integrated ceiling, type of ceiling tile, lighting, and ceiling installed cost (labor and material), and application for each system.

Write B-1159 on reply card, pg. 19

Precision Parts Corp., 400 N. First St., Nashville 7, Tenn., has available a bulletin containing catalog information on their electric **hot water heating boiler**, diagrams of the boiler, and data on the advantages of its use. The boiler comes complete with water circulator and safety valve on models A through K.

Write B-1160 on reply card, pg. 19

Code discussion

(Continued from page 111)

per cent demand factor to be applied to four or more fixed appliances *other than* ranges, air conditioners or space heating equipment *whether or not* the feeder *also* supplies such ranges, air conditioners, or space heating equipment. Formerly, these fixed appliances, in order to qualify for the 75 per cent demand factor, were required to be *in addition* to a range, air conditioner, or space heating equipment.

Table 220-5 (old Table 29) has the first column headed "Number of Appliances" instead of "Number of Ranges" in order to include other cooking units. But to old Note 5 has been added this new sentence: "The branch circuit load for one wall-mounted oven or one counter-mounted cooking unit shall be the name plate rating of the appliance." This prohibits the application of a demand factor to such units unless more than one of any type is connected to the same feeder.

The new Table 220-6 allowing demand factors for clothes dryers has a note which prohibits the 75 per cent demand factor referred to above for four or more fixed appliances from being applied to dryers if the demand factor table for dryers is used. This, of course, is to prohibit the practice of applying *two* demand factors to the same load.

100-amp service required

Section 220-7 permits the optional method of computing the service and feeder loads for a 1-family residence when supplied by a single 3-wire, 115/230 volt, 100-ampere service. Such a 100-ampere 3-wire service is required for 1-family residences by Section 230-41, Exception 1, and by Sec-

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tion. 230-71, Exception 1, where the load is 10 kw or more as computed by the conventional method now outlined in Section 220-4.

Examples of both the conventional and the optional methods of computation are included in Chapter 9. Note that the 100-ampere service is required only where the load is 10 kw or greater after demand factors have been applied. But the optional method of computation is permissible to be used in any case where a 100-ampere or larger service is used regardless of load, provided all of the load is supplied by a single 115/230 volt, 3-wire service. Both rules apply to single-family residences only.

This could result in an owner of a 1-family dwelling being required to install a 100-ampere service, 3-wire, while his neighbor with a multi-family dwelling would be required to install only a 60-ampere service. Fortunately, however, each occupant of *most* duplex houses has his own service equipment which would automatically put him in the 1-family residence class insofar as his service equipment was concerned. And *most* apartment houses using a common service for all residents would require not less than a 100-ampere service because of load requirements.

Most is not all, however. Hence, the inspector as well as the contractor may have some explaining (and selling) to do from time to time if he should be confronted by an irate owner in regard to the exceptional installation where the multi-family dwelling is permitted to have a service of smaller capacity than his own single-family residence.

But before the Code-making authorities are condemned, it should be pointed out that to require a minimum size service of 100-ampere capacity for every installation could bring down the rath of a far larger number of people who own such properties as billboards, trailers, road-side stands, small and perhaps temporary real estate offices, construction shacks, and similar small-load structures, to say nothing of temporary services on construction poles. Besides the 100-ampere, 3-wire service is not required for 1-family residences unless the load is 10 kw or more.

Instead of condemning the members of the Code-making panels, then, for not raising the minimum size to a blanket 100-ampere, 3-wire capacity, it would be somewhat more productive to spend this time selling larger services and adequate wiring where it is needed but not required.

Additional Code changes will be discussed in the next issue of this magazine.

Answers to Code test questions: (1. **F** Article 100) (2. **T** Art. 100) (3. **T** Art. 100) (4. **F** Section 210-6, Exception No. 2) (5. **F** Sec. 210-19-c, Excep. No. 2-d) (6. **c** Sec. 240-27) (7. **b** Sec. 210-22-b) (8. **a** Sec. 210-22-b) (9. **b** Sec. 220-3-b) (10. **a** Sec. 220-4-d).

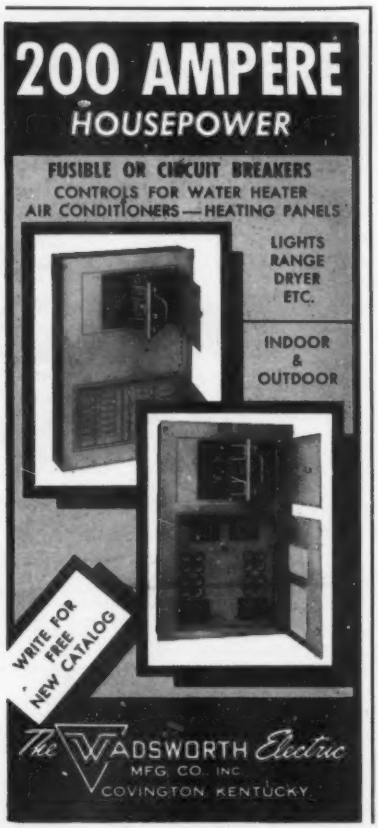
Tap load stations

(Continued from page 84)

tion. In all cases, the damage was minimized by the action of the ground switch.

In a few cases, the aluminum ground switch blade had to be replaced, but in the majority of cases, the damage to this switch was minor and it could immediately be returned to service. Replacement blades for ground switches will be carried in stores.

In the short period of time this



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scheme has been in service, the protection has proved its worth and will probably stay in service for some time to come. It is now considered to be standard installation for tapped substations.

Know the law

(Continued from page 107)

plaintiff from the electrical contractors at various times during the last half of the year 1953 were at the times of receipt applied "on account" as directed by the contractors, plaintiff had no right at the end of the year to distribute the payments as credits on various job accounts and on open account.

(In the meantime, the payments had been credited on plaintiff's books as payments on "general account." But the charges for supplies furnished for specific jobs were merely separate items of that account. The remaining subdivision of the general account covered "open account."

Payments had been made in June, September, and October of 1953. The letter notifying the contractors as to how the payments were finally credited was not written until January 19, 1954. Lawyers for the surety company argued that the payments had not been so credited within a "reasonable time," within the meaning of the rule above quoted. But the debtor firm did not object to the belated crediting of the payment to specific items.

The court said: "A payment credited on a general or running account certainly cannot be considered as *application* of such payment to any special item."

The court referred to decisions by the California and Michigan appellate courts in similar cases where liability of sureties to electrical equipment suppliers was involved. In the California case—Hollywood Wholesale Elec. Co. v. John Baskin, Inc., 263 Pac. 2d 665—a bonding company was sued for a balance due plaintiff on a school construction job.

Certain payments had been made on account between June 28, 1950, and November 24, 1950, and credited to the running account at the time of their receipt. On December 29, 1950, the creditor applied the payments to particular jobs. The California District Court of Appeals decided that this was a valid exercise of plaintiff's right to make such application.

In the Michigan case—People for Benefit of Michigan Electric Supply Co. v. Vandenburg Electric Co., 72 N.W. 2d 216, undesignated payments were entered as general credits on a running account, and the creditor sent the debtor monthly statements. Later, the creditor made a specific application of those payments to particular accounts. The surety contended that the entry of the payments on the general account constituted an application of payments which could not be subsequently altered by the creditor without the debtor's consent. The Michigan Supreme Court overruled the surety's contention.

AIEE meeting

(Continued from page 90)

creasing on another front. The percentage of new plant and commercial building cost allocated to electrical equipment is increasing as industry and commerce automates, air conditions, and similarly calls on electricity for more and more services. Thus the dollars spent for switchgear not only come from dear dollars but they are becoming an increasingly larger share of the total being spent on

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new projects, modernizations and expansions."

Not accounting for installation and maintenance savings, initial investment for a 4.16 kv, 150 mva single bay fused load interrupter unit might be $2,000, while a breaker of the same capacity would cost $5,500, they said.

They advocated "a fresh look" at the economic advantages of buying only as much switchgear capability as required in switching centers, substation primaries and secondaries, and service entrances for industrial and commercial buildings.

Regulators

(Continued from page 79)

Since the standard boost of a feeder voltage regulator is 10%, the curves have been plotted for V_1 magnitudes of from 90 to 100%. If V_1 is less than 90% (for instance 80%) the 90% voltage should be used as a starting point. This does not materially affect the accuracy of final figures since the increase in kilowatt-hour consumption resulting from a change in voltage from the 80% to the 90% level is approximately the same as would result from a change in the voltage level from 90% to 100%.

The following example demonstrates how to use the Revenue Curves: [The numerical values represent conditions for an assumed lightly-loaded feeder.]

Assuming load peak as 500 kw, load factor of .4, kilowatt-hour ratio of lighting load to total load of .6, and effective rate of 2 cents per kwh, the revenue index is found to be 240. (This is the product of 500 x .4 x .6 x 2) Also in this numerical example, it is assumed that V_1=92.5%, and that the regulator equipment investment on the feeder to obtain 100% voltage would be $5,000.

Start at bottom scale of graph where V_1=92.5 (Point A) and proceed vertically to Revenue Index of 240 (Point B). Then move horizontally to the left (Point C) and read the annual increase in revenue which is $2,850 in this case.

The ratio of increased revenue to regulator investment is 2,850/5000 or 57%. To determine the actual return on the investment, other factors must be considered. The regulator equipment investment must include installation costs. The revenue dollars must be reduced by the generation cost for delivering the added load as well as the incremental system losses which it

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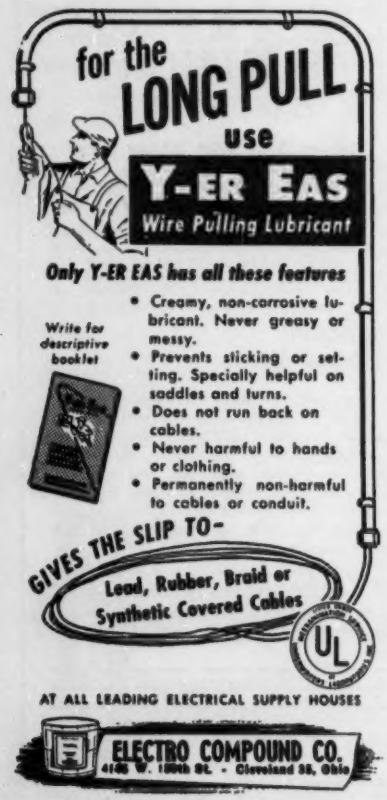
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produces. Taxes and depreciation must also be considered to determine the net profit. A practical way of viewing these factors is by using the equipment carrying charge rate (usually 12% to 15%) as the minimum acceptable value for the ratio of increased revenue to installed regulator investment. The degree to which this ratio exceeds the carrying charge determines the degree to which the rate of return is greater than the minimum acceptable rate.

Capacitors

(Continued from page 75)

8. Locate the capacitor or capacitors by the method outlined in detail in the example application.

9. Check the light load voltages at the capacitor locations and if the maximum voltage is above permissible limits, reduce the total capacitor rating and repeat Steps 6, 8, and 9 until the maximum light load voltage is within the prescribed limit.

Reference

1. Analysis of Capacitor Application as Affected by Load Cycle, R. F. Cook, AIEE Transactions Paper 59-569.

All-electric homes

(Continued from page 52)

oven, garbage disposal unit, and automatic dish-washer. Space and electrical connections are provided in the utility room for automatic washers and dryers.

As a special feature, an extra room may be made of the large two-door garage area. When this conversion is made, electric baseboard heating units are installed along with special indirect lighting fixtures.

Discount system

(Continued from page 60)

and your attorney knows how to earn that $73.00 without you worrying over the two slow payers. Before you know it, you have your entire $363.50 and have lost an undesirable customer.

A good way to find an attorney who will handle your collections at moderate cost is to ask your electrical wholesaler the name of the attorney that handles his collections and ask the percentage the attorney charges. Then have a talk with the attorney, and ask if he will give you the same rate. Fifteen to twenty per cent is a fair rate especially if several contractors and one or more wholesalers use the same attorney. Volume, you know, brings the prices down—usually!

So, small contractors, write yourself a contract; or better, get someone who knows more about it to write one for you. Have it mimeographed, buy some carbon paper, write your bids out in a neat, business-like manner, add the percentage, show the discount, and let someone who knows how to do it collect your doubtful accounts. Then it is more fun doing business.

Downtown service

(Continued from page 56)

"Another trick is encouraging our customers to keep certain extras, such as belts, on hand for emergencies."

The downtown business often brings Mr. Durham face to face with unusual or ticklish problems. Once, on the fire department's recommendation, an ofice building manager called him in to try to determine the origin of a fire. Extensive checking disclosed that the elevator grill was not grounded, static electricity was forming on the grill and discharging through water to cinders beneath, causing them to ignite.

While installing stereophonic sound in a downtown theater Durham electricians rigged ladders with adjustable legs for work over stairways. Installing speakers and feeders in high walls presented a headache because wires had to be fished out of the dark walls. The Durham solution was tieing tiny flashlights to the ends of the wires,

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then fishing them out through holes drilled near the floor.

In a sense Mr. Durham is forcing himself to branch out of the downtown area. His maintenance work and planning ahead for his customers have in the long run reduced his volume of business there. So he has been developing capacity for larger jobs. At present, for example, he is engaged in an extensive remodeling job for one of the largest hospitals in Birmingham. Last year 60 per cent of his total business was downtown; the hospital job will reduce the ratio even more this year.

But Mr. Durham is convinced the backbone of his business for years to come will be in the downtown area, which must always have an electrical doctor on call.

Stadium lighting

(Continued from page 50)

er half of each high tension steel pole, measuring 50 feet in length, was hoisted in place. There it was plumbed up by the workmen on the job. The top section, measuring 40 feet in length, with the complete assembly of lights already installed on the ground, was then lifted and fitted into slip joints high up in the air above the stadium.

The big lighting installation rises 170 feet above the ground. The old system, which was torn down, did not sufficiently cover the playing field with proper lighting. The new system eliminates all shadows and spotty areas. As an example, the old system provided only 25 to 30 footcandles in the intricate areas of the field. The new system now gives a uniform 115 footcandles all over.

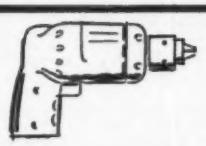
By installing the floodlighting system so high up and utilizing more narrow beam floodlights, the concentration of maximum candlepower is focused on the playing field itself and away from the eyes of the spectators on opposite sides of the field. The old system frequently emitted a glare that hindered the vision of the players as well as the spectators.

The 1,500-watt lamps are equipped for push button control. Each individual pole can be turned on and off by the push of a button. And as an added precaution, the Sachse electricians installed two individual electrical feeder lines from the power house to the stadium. In the event one line has mechanical failure, the alternate feeder line takes over for uninterrupted lighting in crucial moments during the important night football games at Tiger stadium. Under the old lighting facilities, if one section happened to go off, the entire side of the field was in darkness.

Each tower is also equipped with a 112 kva transformer, connected on the upper promonade below each of the tower units.

With careful precision the contractor installed each lamp unit by peep sight on center line of the fixture. Each fixture was spotted to a particular point so that the lighting was diffused and crossed, leaving no shadows on any section of the field. In fact, the floodlights are so situated that a football game can easily be played with only half the lights in operation.

The LSU Tiger fans are happily aware of this tremendous increase in strain-free vision provided by the new electrical installation, which gives them day-time viewing on the darkest of nights.



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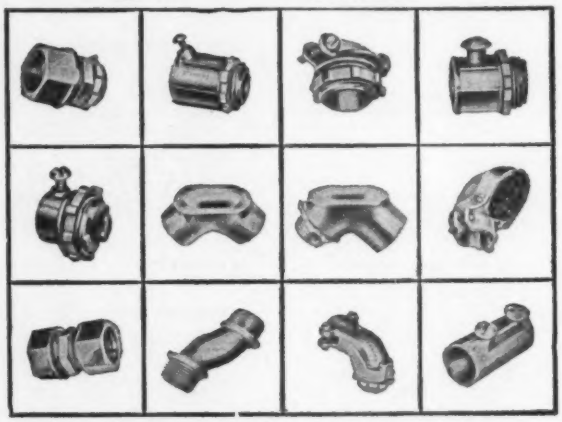

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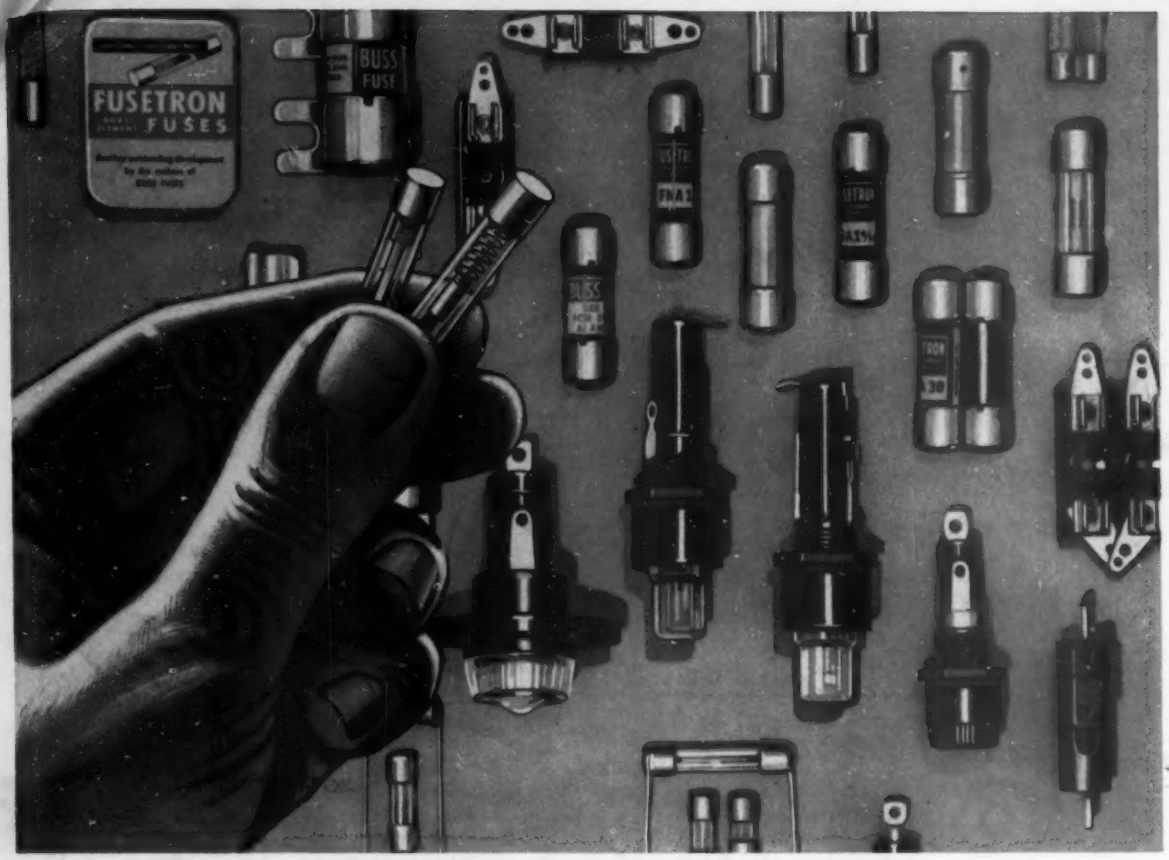

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